

**Research Note 2012-07**

# **Methods and Tools for Training Crisis Response**

**Laura A. Zimmerman, Jeffrey M. Sestokas, and  
Christopher A. Burns**  
Klein Associates

**James Bell and David Manning**  
Dynamics Research Corporation



**Fort Hood Research unit  
Scott B. Shadrick, Chief**

**August 2012**

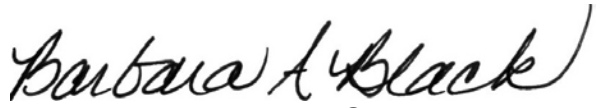
**United States Army Research Institute  
for the Behavioral and Social Sciences**

Approved for public release; distribution is unlimited.

**U.S. Army Research Institute  
for the Behavioral and Social Sciences**

**Department of the Army  
Deputy Chief of Staff, G1**

**Authorized and approved for distribution:**

  
**BARBARA A. BLACK, Ph.D.**  
**Research Program Manager**  
**Training and Leader Development**  
**Division**

  
**MICHELLE SAMS, Ph.D.**  
**Director**

---

Research accomplished under contract  
for the Department of the Army

Klein Associates, and  
Dynamics Research Corporation

Technical review by

Peter S. Schaefer, U.S. Army Research Institute  
Christopher L. Vowels, U.S. Army Research Institute

**NOTICES**

**DISTRIBUTION:** This Research Note has been cleared for release to the Defense Technical Information Center (DTIC) to comply with regulatory requirements. It has been given no primary distribution other than to DTIC and will be available only through DTIC or the National Technical Information Service (NTIS).

**FINAL DISPOSITION:** Destroy this Research Note when it is no longer needed. Do not return it to the U.S. Army Research Institute for the Behavioral and Social Sciences.

**NOTE:** The findings in this Research Note are not to be construed as an official Department of the Army position, unless so designated by other authorized document.

REPORT DOCUMENTATION PAGE						
1. REPORT DATE (dd-mm-yy) August 2012		2. REPORT TYPE Final		3. DATES COVERED (from. . . to) 1 July 2007 – 1 January 2010		
4. TITLE AND SUBTITLE Methods and Tools for Training Crisis Response				5a. CONTRACT OR GRANT NUMBER W74V8H-04-D-0048		
				5b. PROGRAM ELEMENT NUMBER 622785		
6. AUTHOR(S) Laura A. Zimmerman, Jeffrey M. Sestokas, and Christopher A. Burns (Klein Associates); James Bell, and David Manning (Dynamics Research Corporation)				5c. PROJECT NUMBER A790		
				5d. TASK NUMBER 272		
				5e. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  Klein Associates, A Division of      Dynamics Research Applied Research Associates, Inc.      Corporation 1750 Commerce Center Blvd      955 N. Wilson Rd., Suite E North Fairborn, OH 45324-6362      Radcliff, KY 40160				8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Research Institute for the Behavioral and Social Sciences ATTN: DAPE-ARI 6000 6th Street, Bldg. 1464 / Mail Stop: 5610 Ft. Belvoir, VA 22060-5610				10. MONITOR ACRONYM ARI		
				11. MONITOR REPORT NUMBER Research Note 2012-07		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.						
13. SUPPLEMENTARY NOTES COR and Subject Matter POC: Scott B. Shadrick						
14. ABSTRACT ( <i>Maximum 200 words</i> ): This report documents an effort initiated by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) to refine behavioral training themes for crisis response and expand the Red Cape training methodology. As a part of the research and development, a web-based collaborative training program for use in a distributed environment and theme-based training vignettes for the U.S. Army Management Staff College's Garrison Pre-commander Course were developed. The research expands the theme-based training method to allow personnel from multiple, distributed agencies to train on large-scale crisis events. The research refined the Red Cape crisis action themes based on a cognitive task analysis with experts and developed scenarios within Think Under Fire Decisions (TUF-D), a rapid training development tool. The training system also incorporates an instructional overview guide and assessment tools, along with a vignette creation tool that allows individuals to rapidly develop training scenarios that address their specific needs and requirements.						
15. SUBJECT TERMS Interagency training, Crisis management, Theme-based training						
SECURITY CLASSIFICATION OF			19. LIMITATION OF ABSTRACT Unlimited	20. NUMBER OF PAGES 68	21. RESPONSIBLE PERSON Dorothy Young 703-545-2316	
16. REPORT Unclassified	17. ABSTRACT Unclassified	18. THIS PAGE Unclassified				



**Research Note 2012-07**

## **Methods and Tools for Training Crisis Response**

**Laura A. Zimmerman, Jeffrey M. Sestokas, and  
Christopher A. Burns**  
Klein Associates

**James Bell and David Manning**  
Dynamics Research Corporation

**Fort Hood Research Unit  
Scott B. Shadrick, Chief**

**U.S. Army Research Institute for the Behavioral and Social Sciences  
6000 6<sup>th</sup> Street, Bldg 1464  
Fort Belvoir, VA 22060**

**August 2012**

---

**Army Project Number  
622785A790**

**Performance and  
Training Technology**

Approved for public release; distribution is unlimited.

## ACKNOWLEDGEMENT

---

The authors would like to thank all those who contributed to the development of the materials created in this effort. We would especially like to thank the Joint Operations Center (JOC) Indiana National Guard. The Indiana National Guard provided JOC staff officers and other members of Indiana emergency response organizations to interview, which led to a better understanding of crisis response operations.

In addition, we thank the Operations Center Manager, Ron Jenkins, and Chief Planner, Joel Tiotuico, of the Fort Knox, KY, U.S. Army Garrison Installation Operations Center for their valuable insight on Army garrison post-wide emergency response operations. We also thank Patrick Cathcart, Director Command Programs, at the U.S. Army Management Staff College for allowing us to interview instructors and students and observe the Garrison Commander Course.

Finally, would like to acknowledge the following for their assistance and contributions in the development of this effort.

- COL Barry J. Fowler, Defense Coordinating Element VII-Kansas City
- Steven Holcomb, Department of Indiana Homeland Security
- LTG (Ret.) Russel L. Honore, Commander U.S. First Army and Joint Task Force Katrina
- MAJ Lisa Kopczynski, Joint Training and Exercise Officer, Indiana National Guard
- LTC (Ret.) William “Mac” McElroy, 2<sup>nd</sup> Region, U.S. Army Cadet Command
- LTC (Ret.) Alan Petty, J3, Florida National Guard
- COL Joseph Southcott, J3, U.S. Northern Command (NORTHCOM)

## METHODS AND TOOLS FOR TRAINING CRISIS RESPONSE

### EXECUTIVE SUMMARY

---

#### Research Requirement:

The goal of this research effort was to extend the current U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) theme-based training method to understand how to train personnel from multiple agencies, both military and domestic, who respond to large-scale crisis events. The three research and development initiatives discussed in this report advance the initial Red Cape training method (Schaefer, Shadrick, Beaubien, & Crabb, 2008) by addressing the training requirements of personnel who respond to crisis events.

#### Procedure:

In order to create the training products that achieve the research objectives, a Cognitive Task Analysis (CTA) was conducted to identify the cognitive skills experts use when responding to emergency events.

The CTA involved crisis management experts from the military and civilian community, including non-governmental agencies. The interview data was used to develop scenarios that address the training needs of diverse civil-military organizations incorporating the critical tasks, expert strategies, and decision requirements into the exercise scenarios. In addition, the CTA findings were used to update behavioral themes associated with expert crisis response. As a part of the CTA, faculty from the Garrison Pre-commander Course at the U.S. Army Management Staff College were interviewed, and current training was observed in order to gain an understanding of the training needs and requirements. Building on previous training materials, multimedia training products using animation, audio, video, and other methods were developed to address the training requirements. Interview and observational data were used to create three vignettes with facilitated questions and discussion points for garrison commanders and their staff. These vignettes focus on the specific behavioral themes and promote in-class discussion and feedback. A facilitator guide with questions and discussion points was derived from the interview data.

Results of the CTA were used to develop a vignette-authoring tool utilizing the Think Under Fire Decisions (TUF-D) portal. To create the tool, the manual scenario creation process used in previous research was adapted to develop a self-contained, step-by-step semi-automated process. An instructional overview guide was developed based on systematic instructional systems design (ISD) principles using text, interactive graphics, and videos to accommodate the visual learner and audio-based graphics for the auditory learner.

## Findings:

The research and analysis resulted in three related training products (theme-based training for large-scale crisis response involving multiple agencies, an authoring tool for scenario development, and crisis response training for garrison commanders and their staff). Interview data revealed the individual knowledge and skills critical to effective decision-making in rapidly changing crisis action situations and differentiated the critical tasks and skills required for each role and agency. The data was used to identify new decision patterns, refined the initial nine Red Cape themes, and established a list of vignette situations. Three vignettes were created, including scenarios related to an earthquake, a bombing, and a riot at a political convention. The vignettes contain multiple events and branches that lead to logical follow-on events. This training structure allows for deliberate practice with focused tasks and instant feedback. To support vignette creation, an authoring tool was developed and integrated in the TUF-D simulation to allow a systematic vignette development and implementation process. An instructional overview was produced to explain the purpose and benefits of theme-based training, and provides instruction on how to use the authoring tool.

In addition to the scenarios developed for large-scale crisis response, three crisis action vignettes were developed for garrison commanders: a train derailment, a bombing attack, and a tornado. The training vignettes can be completed over the internet or on a self-contained CD-ROM. The goal of the garrison commander vignettes was to design content that promoted reflectivity, active engagement, and personal relevance of knowledge. The training comes with a facilitator guide that is structured the same for each of the three exercises. A scene description provides a high-level account of the scenario. Each segment contains critical thinking questions and a variety of discussion points.

## Utilization and Dissemination of Findings:

Army National Guard units and other federal, state, and local crisis response agencies can use this training program and authoring tool to train emergency responders in their areas. They can use the authoring tool to create vignettes that address their current and evolving training needs. Because all TUF-D products, including the tools and scenarios created during this research, are on the National Guard server, they are available at no cost to all National Guard units. The instructors at the U.S. Army Management Staff College are using the training vignettes to train new garrison commanders how to respond to emergencies on Army installations. The vignettes are tailored so that they can be distributed and shared with other Army garrison staffs to better prepare these units to respond to emergency events.



# METHODS AND TOOLS FOR TRAINING CRISIS RESPONSE

## CONTENTS

---

	Page
INTRODUCTION .....	1
Justification for Theme-Based Training .....	2
Creating Cognitively Authentic Scenarios .....	4
Advantages of Theme-Based Training .....	8
Summary of Projects .....	10
GLOBAL RESPONSE: LARGE SCALE INTERAGENCY TRAINING .....	11
METHOD .....	13
Participants .....	13
Procedure .....	13
Analysis .....	13
RESULTS AND DISCUSSION .....	15
Updated Themes .....	15
Scenario Creation .....	17
Creating Training in TUF-D .....	18
VoIP .....	19
Performance Assessment .....	20
EVALUTION OF SCENARIOS/TRAINING .....	21
Method .....	21
Results and Discussion .....	22
GLOBAL RESPONSE CONCLUSIONS .....	23
IMPLEMENTING UNIQUE USER REQUIREMENTS AND TRANSITIONING RED CAPE TRAINING .....	24
METHOD .....	25
Procedure .....	25
RESULTS AND DISCUSSION .....	26
Instructional-Overview Guide .....	27
Scenario Generation .....	28

## CONTENTS (Continued)

---

	Page
EVALUATION.....	28
Method .....	28
Results and Discussion .....	29
TRANSITIONING THE RED CAPE CONCLUSIONS .....	30
GARRISON COMMANDER TRAINING .....	31
METHOD .....	31
Participants.....	31
Procedure .....	32
Analysis.....	32
RESULTS AND DISCUSSION .....	33
Scenario Creation.....	33
Facilitator Guide .....	34
GARRISON COMMANDER TRAINING CONCLUSIONS .....	35
GENERAL DISCUSSION .....	35
REFERENCES .....	39
Appendix A. Think Under Fire (TUF) Decisions.....	A-1
Appendix B. Global Response: Large Scale Interagency Training Interview Guide: Camp Atterbury .....	B-1
Appendix C. Red Cape Themes Overview .....	C-1
Appendix D. Evaluation Survey Day 1: Camp Atterbury .....	D-1
Appendix E. Evaluation Survey Day 2: Camp Atterbury.....	E-1

## LIST OF TABLES

TABLE 1. PROJECT OUTCOMES.....	11
TABLE 2. DECISION REQUIREMENT TABLE OF DATA CATEGORIZED UNDER THE THEME “SEE THE BIG PICTURE” .....	14
TABLE 3. COMPARISON OF UPDATED THEMES TO ORIGINAL THEMES .....	16

LIST OF FIGURES

FIGURE 1. TEAM SENSEMAKING MODEL .....	7
FIGURE 2. TUF-D INTERFACE .....	19
FIGURE 3. AFTER ACTION REVIEW .....	21
FIGURE 4. VIGNETTE CREATION TOOL .....	26
FIGURE 5. GARRISON COMMANDER VIGNETTE .....	32
FIGURE 6. FACILITATOR GUIDE QUESTIONS AND DISCUSSION POINTS .....	34

# **METHODS AND TOOLS FOR TRAINING CRISIS RESPONSE**

## **Introduction**

As tragic events such as Hurricane Katrina have demonstrated, a key component of a successful response to a crisis event is the ability of agencies to work as coordinated teams in cooperative environments. The National Response Framework (NRF) provides a scalable, flexible, and adaptable framework for coordinating agencies to align key roles and responsibilities as they manage incidents from the local event up to large-scale terrorist attacks or catastrophic natural disasters (U.S. Department of Homeland Security, 2008). The national framework calls for cooperation and understanding between local communities, tribes, states, the federal government, non-governmental organizations (NGO), and the private sector as they strive to achieve shared goals. Each responding agency is responsible for developing the capabilities needed to respond to incidents, conduct training exercises and assessments, provide resources and capabilities, and gather lessons learned. An effective response, as described by the NRF, hinges upon invested, well-trained leaders and responders who have developed partnerships and are able to achieve shared objectives. The aim of the research presented in this document is to provide agencies with training tools and methods to achieve the goals outlined in the NRF.

The U.S. Army Training and Doctrine Command (TRADOC) focuses on the “human dimension” of military operations within future operational environments. TRADOC discusses the need for Soldiers to possess higher order cognitive skills, such as the ability to synthesize information rapidly, make quick, accurate, situational assessments, and adapt to rapidly changing operations (U.S. Army Training and Doctrine Command, 2008). TRADOC identified a need for training that supports Soldiers as they advance through their careers. The training must accommodate not only the increasing and diverse skill levels of Soldiers but also new and changing environments and situations. They call for the development of well-designed distributed learning that:

- provides realistic training that develops internal mental models,
- enhances self-evaluation and continual learning,
- contains virtual vignettes and automated coaches,
- allows for tailorable training to fit specific needs and changing missions,
- enables Soldiers to learn in modes (visual, auditory, verbal, etc.) that suit them best,
- has the capacity to train units without cumbersome external support,
- provides authoring tools to enable modification of scenarios as needed, and
- takes a systematic outcome oriented approach to evaluation.

Addressing many of the training requirements described above, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) conducted research to develop training methods and tools to train U.S. Army National Guard personnel and their civil-military interagency partners to respond effectively to crisis events (Schaefer, Shadrick, Beaubien, & Crabb, 2008). The training, called Red Cape: Crisis Response Training for National Guard and Interagency Teams, applied theme-based training methodology to train crisis response teams.

This report presents the relevant background research that formed the basis for the original Red Cape training. In addition, the report describes the methods and results of research conducted to expand the Red Cape methodology to address large-scale crisis response, develop methods and tools to allow users to create mission relevant crisis response scenarios, and develop methods and tools to train crisis response requirements for garrison commanders and their staff. The purpose of the research was to transition the Red Cape training to a distributed training environment, improve the existing training delivery technology, create a scenario-authoring tool, and refine the themes for national crisis response situations.

First, we discuss the need for theme-based training along with the theoretical and research-based foundation upon which this training was constructed. Following that discussion, we present the research methods, development, and results of the major objectives of the research. After discussing the research objectives and each exemplar training product, we present a short summary of the entire training package and then offer conclusions and recommendations.

### *Justification for Theme-Based Training*

Many challenges exist when attempting to train teams formed of diverse personnel from multiple agencies to cooperate and work together. Agencies often have different missions, resource needs and requirements, mission objectives and goals, and operating procedures. Training using live, large-scale exercises has been used to train multiple agencies to respond to an emergency. While live, multi-agency emergency response training is valuable for specific purposes, it has some drawbacks, such as:

- multi-agency training rarely occurs,
- multi-agency training is difficult to coordinate,
- live exercises are costly in both money and time,
- live exercises often lack targeted skills training, and
- live exercises often do not train to the skill level of the students.

While these factors inhibit the use of live training, it is vital that multi-agency crisis training occurs. Without this training:

- responders do not learn the needs, requirements, and procedures of other agencies,
- turf-wars erupt during events over who is in charge,
- little chance exists for cooperative relationships to develop prior to actual events, and
- conflicting priorities and goals cannot be negotiated and resolved.

Working in cooperative team environments during crisis events adds complexities to the response process that challenge most decision makers. Decision-making in complex, high-stakes, emergency events requires the ability to make sense of situations, sort through a flood of conflicting information, manage uncertainty and risk, and adjust actions and plans to fit dynamic, evolving, situations (Klein, 1998). Engaging in this type of cognitive processing is termed “adaptive thinking.” The ability of decision makers to adapt their thinking is particularly important when plans do not go as expected or when facing novel challenges. Adaptive thinking

skills tend to develop with experience and require extensive training in realistic environments before these skills will become automatic (Lussier & Shadrick, 2004).

In large-scale emergencies, experienced decision makers, as well as those with little or no experience, must engage in complex cognitive tasks such as making sense of unfolding events, assessing large amounts of incoming information, creating a coherent story of current and future events, and determining the correct course of action. Without knowledge and experience to draw from, it is difficult to know how to react in an effective manner. Decision makers build this knowledge base with experience that develops from responding to real-world events or from participating in realistic training events.

Research examining the development of expertise demonstrates that these skills develop through repeated and lengthy exposure to situations requiring a specific skill set. This indicates that individuals acquire expertise in domain specific contexts and experts acquire skills by doing tasks that promote learning in their domain of specialty (Ericsson & Charness, 1994; Ericsson, Krampe, & Tesch-Römer, 1993). Theme-based training targets these experience-borne skills by identifying the cognitive skills of experienced decision makers, categorizing them into themes, and presenting them implicitly during realistic scenario-based training exercises. These themes define the predominant cognitive skills required to handle a given set of circumstances (Schaefer et al., 2008). The themes for the Red Cape training are listed below.

- **Maintain Focus on Mission Priorities:** Effective managers recognize that their primary mission is to protect human life and property, with safety being paramount.
- **Keep the Chain of Command Flexible:** Effective managers recognize that the chain of command does not remain fixed throughout the crisis.
- **See the Big Picture:** Effective managers remain aware of what is happening around them, with particular attention to the impact on higher, adjacent, lower, and supported organizations.
- **Plan for and Recognize Decision (Trigger) Points:** Effective managers identify key and measurable indicators that require immediate action.
- **Reprioritize as Necessary:** Effective managers continually reassess the scope and priority of mission requirements as the crisis unfolds.
- **Use All Available Assets:** Effective managers remain aware of what assets are available to them, what their limitations are, and what lead times are required.
- **Think in Shades of Gray, not Black and White:** Effective managers recognize that they will be working with imperfect and incomplete information from a wide range of organizations and individuals.
- **Model a Dynamic Situation:** Effective managers recognize that the cause of the incident may be an accident or act of nature, or it may be either criminal or terrorist activity.
- **Understand the Public Need:** Effective managers recognize that the public will experience a wide range of emotions, from proactive attempts at involvement to a passive acceptance of the situation.

The knowledge and behaviors encompassed within the themes stem not from the conscious knowledge of experts but rather they stem from the implicit skills developed through experience. Because the themes provide a behavioral model of high-level cognitive skills, they

offer valuable guidelines for training development. However, simply teaching the theme definitions will not cultivate these cognitive skills in students. Instead, students must practice these themes within the context of relevant events and environments (Lussier, Shadrick, & Prevou, 2003).

### *Creating Cognitively Authentic Scenarios*

Surrogate experiences provide effective training of high-level performance in crisis events. To create surrogate experiences, it is first necessary to understand the perceptual and decision-making expertise required to handle situations with substantial cognitive complexity. Then, it is possible to create authentic and complex training environments by incorporating the real world experiences of experts (Harris-Thompson, et al., 2004). This approach allows training developers to create scenarios with appropriate context for training cognitive as well as procedural skills.

### *Cognitive Task Analysis*

Cognitive Task Analysis (CTA) is a set of tools and techniques used to identify expert behaviors and understand the critical tasks needed to create cognitively authentic scenarios. The purpose is to “unpack” the knowledge base of domain experts so that this knowledge is available to training developers. Cognitive Task Analysis is a family of methods and tools used to elicit the processes, cognitive demands, and training requirements within a specific task or domain. The purpose of CTA is to “get inside the heads” of the decision makers to understand the factors that guide their decision-making processes and identify other critical elements of performance (Crandall, Klein, & Hoffman, 2006). The information gathered from CTA allows us to understand the cognitive requirements that are necessary to accomplish the diverse challenges that arise in multi-agency settings. By documenting these cognitive skills, the analyst is able to discover how decision makers think, clarify challenging task elements, and identify the support needed to resolve crisis events. Once this knowledge is extracted, it is used to develop decision support tools and training programs.

### *Deliberate Practice*

An understanding of critical cognitive skills is important to developing authentic training, but the training will not be effective if it is not delivered in a manner that facilitates learning. One key to learning critical thinking skills is deliberate practice. Deliberate practice is training that focuses on expert behaviors and performance in difficult environments (Lussier et al., 2003). Rather than requiring learners, who do not have the necessary knowledge base, to function in complex environments, deliberate practice focuses on repetitive training of targeted skills to near automatic levels. When the targeted skills are theme-based, the skill development is implicit in the tasks performed. For instance, training focused on *seeing the big picture* might involve a student receiving a request from the local mayor for assistance transporting wounded citizens to the hospital. The student is aware that they are running low on transport vehicles. His response might be a simple “sorry, I can’t help you,” which insures he has adequate resources for post operations. The bigger picture is that, by not providing help, he has fractured his relationship with the local town government and may lose their support in the future, or, by refusing to

provide assistance, off-post troops or family members needing assistance do not get the necessary care. In later training, the student who sees the big picture might think creatively to find the requested resources on post or might use his established contacts to find resources elsewhere. In this way, the student implicitly learned to see the big picture.

Lussier et al., (2003) discussed the following key characteristics of deliberate practice.

- Repetition: Students perform tasks repetitively in order to create automatic behaviors similar to experts.
- Focused feedback: Task performance is evaluated during performance and feedback is provided in the form of positive and negative consequences.
- Immediacy of performance: After feedback, students repeat the task in order to reinforce the corrective actions.
- Stop and start: The feedback loop allows students to perform tasks in brief segments with feedback breaking up the continuous flow of the event.
- Emphasis on difficult aspects: With focus on challenging expert cognitive skills, the difficult rather than mundane (or procedural) aspects of emergency response situations are presented within the scenarios.
- Focus on areas of weakness: When instructors identify areas of weakness, they can tailor exercises to fit individual needs.
- Conscious focus: Students consciously attend to the thinking behaviors that experts generally engage in at an automatic level. By repetitively performing these behaviors, students incorporate them into their decision processes and they become automatic
- Work vs. play: Deliberate practice requires a level of effort that is not necessarily present in live exercises or some game-based learning scenarios, where training often feels more like play than work.
- Active coaching: Monitoring students' performance should be continuous so students experience the implications of their actions immediately, as they would in actual events. They should then learn corrective action and thus have positive performance reinforced with positive consequences.

### *Feedback*

A key to deliberate practice is immediate and focused feedback. Feedback is an essential component of efficient decision-making and necessary for the development of expertise in a given domain (Klein, 1998). Research has found that people who develop expertise tend to seek out feedback after performing tasks (Ericsson et al., 1994; Ericsson et al., 1993). Simulated exercises that incorporate theme-based training provide instant feedback to students by presenting the consequences of their actions (or inaction) and forcing them to react. For example, the consequences of not seeing the big picture and refusing to assist the local mayor might result in negative media attention, reduced support in return, and otherwise preventable loss of personnel. These consequences may come to the student in the form of an e-mail informing them of a Soldier's death in the town due to inability to get to the hospital. Another consequence may be a news brief reporting the uncooperative actions of the National Guard, or a



telephone call from the mayor saying he is ordering his volunteer fire department to discontinue their assistance in fighting a fire on post.

The Red Cape training provides feedback during automated after action reviews (AAR). The AARs show the expert behaviors and categorizes these behaviors by themes. In this way, instructors can examine areas of weakness and create scenarios that contain behaviors and tasks focused on the themes students need to practice. For example, if the AAR reveals that a student rarely took into consideration the big picture, the instructor can create a scenario that challenges the student to look beyond immediate concerns and confronts the students with multiple consequences when he/she takes action without looking at the big picture. The instructor can demonstrate the positive consequences if the student does see the big picture. This type of automated and facilitated feedback encourages students to seek feedback and teaches them how to self-assess their performance—qualities that develop expertise.

### *Training to Skill Level*

A goal of deliberate practice is to shape automatic behavior, thus it is important to train at levels that are appropriate for the students (Shadrick & Lussier, 2004). If students confront complex situations that are challenging to even the most seasoned commanders, they will flounder and fail. Students need to practice targeted skills appropriate to their skill levels until those skills become automatic. As students' skills become automatic and the skill levels increase, they can manage situations that are more complex. Theme-based training allows instructors to initially create scenarios with few targeted theme-based skills and then increase the level of difficulty as student skills increase. The system allows instructors to present the scenarios at a pace that fits student skill levels and provides hints to guide new students through the event. Instructors can remove these hints when students reach the appropriate level of performance.

### *Mental Models*

By training themes, decision makers develop the mental models necessary to manage large-scale events. Mental models are like a picture puzzle that provides decision makers with an accurate picture of the current and future situation (Crandall et al., 2006; Klein, 1998). The more detailed and complete the mental model, the clearer the picture and the more detailed the set of potential actions the decision maker can access as they map their mental model onto the actual situation. Without a relatively complete and diverse set of mental models, it is difficult to adapt thinking to fit the current situation. Theme-based training improves performance by focusing on the deliberate practice of these skills. This type of practice provides decision makers with the opportunity to form mental models and advance their skills to levels closer to experts. After receiving a small amount of information, decision makers with incomplete mental models are unable to form an accurate picture of the situation based on the information received. When the mental model is complete, decision makers can take those same few bits of information and construct a near-complete picture of events.

Training and performing as teams, particularly distributed teams and ad hoc teams, presents unique challenges. While cognitive skills training often attempts to improve individual skills, these improvements will not affect operations if the team does not function well as a unit at the cognitive level. If teams do not have a shared understanding of events or of each individual's role within the team, they will not function well in team environments. Just as the individual mind develops cognitive skills, so too does the "team mind." A developed team mind forms a clear identity, establishes routines, manages the flow of ideas, and engages in adaptive thinking (Klein, 1998). As the team mind develops, it develops a stronger identity, and team members are able to monitor and assist one another, they are better able to manage uncertainty, and they more adeptly perform basic procedures. Research on team decision making revealed that the key difficulties encountered by teams was that they were not clear about their roles and functions, and that they struggled to maintain shared situational awareness (Klinger & Klein, 1999).

To maintain a shared situational awareness, teams need to calibrate their sensemaking. Sensemaking is the process of understanding what is going on in a situation (Weick, 1995). The research literature differentiates between individual sensemaking and team sensemaking. Individual sensemaking occurs as people search for connections between multiple events, individuals, and environments. Team Sensemaking is team members' coordination of the search for these connections. Just as individual sensemaking seeks to explain and anticipate events, team sensemaking coordinates team efforts to explain and anticipate. Specific requirements exist during the sensemaking process at the team level, such as the need to coordinate, the ability to maintain common ground, and the understanding to manage distributed knowledge (Long & Klein, 2006; see Figure 1). Team sensemaking involves the coordination of explanations and anticipations. A simple model shows the major components of team sensemaking.

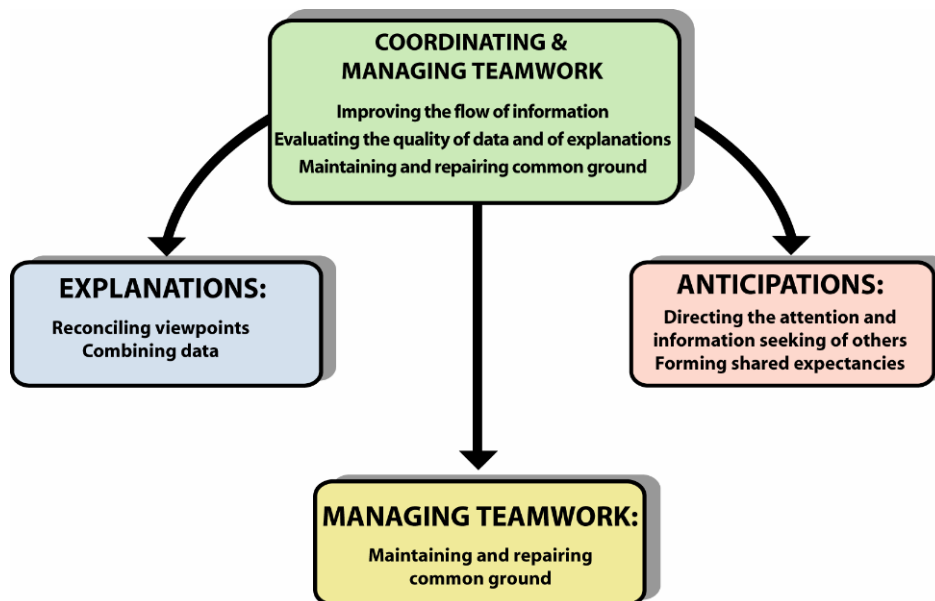


Figure 1. Team sensemaking model.

- Explanations: It is difficult for teams to combine data received by various team members. Team members must know what data to share without overloading the team. They need to understand how their data fits into the larger picture and must reconcile their individual viewpoint with the team viewpoint.
- Anticipations: Teams need to direct and manage attention so they can form shared expectancies during the event. For a team to anticipate events effectively they must form an integrated view of the likely twists and turns that might occur during the situation.
- Coordination. There are three key components of coordination.
  1. Controlling and improving the flow of information – team sensemaking depends on being able to gauge what to share and what to withhold.
  2. Evaluating the quality of data – the team needs to assess whether or not data is credible.
  3. Maintaining and repairing common ground – common ground is the knowledge, beliefs, goals, commitments, and routines that permit effective communication and coordination. Common ground is established by understanding what others know, the routines they can carry out, their goals, their roles and functions, and their current condition (e.g., workload, fatigue, competing priorities).

The themes incorporate these key components of team sensemaking. By training to the themes, students practice the requirements necessary to obtain team situational awareness. Training for teams should be developed to allow the teams to practice team sensemaking and begin to develop a team mind when responding to emergency events.

In team training, it is necessary to incorporate:

- team strategies and competencies,
- the functions and processes that teams need to master (such as how to communicate intent, or how to assist other team members),
- individual team member's roles and the influence of their roles on the team,
- the team's ability to develop a shared understanding of the situation, and
- the team's ability to monitor its own performance.

#### *Advantages of Theme-Based Training*

Theme-based training provides instructors with a method for training complex critical thinking skills. By training to these themes, students increase their ability to assess situations, synchronize personnel, assets, and agencies, and execute plans by taking appropriate action in a timely manner.

The following list provides advantages to instructors using theme-based training.

- Provides a method for training implicit expert cognitive skills. Because the cognitive skills are embedded within the physical tasks, instructors can choose the tasks to teach rather than having to figure out how to teach complex thinking processes.
- Provides focus within complex simulated events. Live events often lack focus on specific skills. The themes provide a guide for creating scenarios that provide deliberate practice of specific skill sets.
- Captures the complexity of multi-agency response situations. The themes are generalizable across agencies and responder roles. Thus, the tasks specific to one role may not intersect with tasks required in other roles yet they can all train to the same theme.
- Effective training method evaluated by researchers under a variety of test conditions. Because research has demonstrated the effectiveness of theme-based training, instructors do not have to wonder or assume the utility of this training.
- Automated feedback for individuals allows simultaneous training of multiple students. It is difficult for instructors to monitor and give feedback to all students during complex simulated training. This training provides feedback based on the interconnected theme-based tasks to individual students.
- Themes developed based on the experiences of experts. To create theme-based training, the implicit experience-based cognitive processes of experts are gathered using systematic knowledge elicitation techniques. Most training does not extend beyond training procedures or tactics. Theme-based training focuses on the critical thinking skills that lead to expert performance.
- Behaviors that are linked to their associated cognitive skills. Experts provide the thoughts and decision processes associated with the actions they took to resolve actual crises. This creates a link between behaviors and the thinking that lead to those behaviors.
- Trains at the individual and team level. A key to deliberate practice is training at the appropriate level. As students' skills improve, instructors provide theme-based tasks that are increasingly more complex; the difficulty of the tasks increase as the complexity of students' mental models increases.

The following list provides advantages to students receiving theme-based training.

- Allows for deliberate practice of targeted skills. When a skill is lacking, a student receives training that focuses on their area of weakness. By repeatedly focusing on these areas, the skills become automatic and are embedded within the student's mental model.
- Enhances adaptive thinking skills. In complex, uncertain situations with continually unfolding events, decision makers must adapt their thinking to the changing circumstances. Theme-based training forces students to engage in adaptive thinking. This type of dynamic thinking develops through extensive practice. Students can gain these skills in controlled environments with consistent feedback.

- Engaging training environment. Because theme-based scenarios embed tasks that require complex thinking, they are more engaging than simple scenarios that do not resemble the real world.
- Development of automatic processes and skills. Repetitive training provides an opportunity to perform the activities required which allows for a deepening understanding of the complexities and nuances that surround crisis events. These skills become automatic through repetition.
- Provides opportunities to expand students' experience bases so they are better prepared to respond to actual incidents. With mental models developed to a level of detail that resembles experts, students are better able to respond during real events.
- Provides instant feedback. Feedback is a key to learning. When feedback occurs within an event, students can understand the consequences of particular actions and learn how to take corrective action.
- Training to appropriate skill level. Training that is focused on realism often requires students to perform above their current skill level. When training is too advanced, students become frustrated and do not learn because they do not have the background knowledge and base skills required by individuals at advanced levels.

The themes are general enough to apply across a variety of domains, and when thought about in the context of particular domains, they provide guidance about the cognitive and behavioral requirements specific to that domain. For example, a theme when thinking strategically at the command level is “see the big picture.” This theme generalizes across many situations and domains. When applied to commanders in multi-agency emergency response situations, examples of behavioral indicators for this theme might be “focus on larger concerns, rather than deliberating over only small matters” or “take into consideration the consequences of actions to outside agencies and the community.”

### *Summary of Projects*

The next section will discuss the exemplar training products developed during this research. The training methods and tools created during this research address issues to the U.S. Army and other emergency response agencies. By understanding the critical thinking skills necessary to perform during large-scale multi-agency emergencies, it is possible to develop realistic training that focuses on deliberate practice and teaches adaptive thinking at the appropriate skill levels. The tool we use for training delivery allows students to train as teams, thus this training promotes team sensemaking. Automated and facilitated feedback allows students to develop the critical thinking skills necessary to gain expertise in this domain.

The report describes research to develop training for large-scale multi-agency emergency responses using a theme-based training methodology. After that discussion, we report on a vignette creation tool developed specifically to allow trainers to develop scenarios that fit current and evolving training needs. The tool comes with a detailed instructional overview guide that explains the theme-based method and the themes critical to the actual training. The tool was used to create scenarios for large-scale multi-agency emergency response training. Finally, we discuss garrison commander training developed as scenario-based, in-class training. The three

scenarios and facilitator questions in the Garrison Commander package are theme-based and incorporate the same teaching techniques as the Global Response project (see Table 1).

Table 1

*Project Outcomes*

<b>Global Response Training</b>	<b>Authoring Tool</b>	<b>Garrison Commander Training</b>
<ul style="list-style-type: none"> <li>➤ Updated Red Cape themes</li> <li>➤ Three CTA driven scenarios</li> <li>➤ Web-based training exercises</li> </ul>	<ul style="list-style-type: none"> <li>➤ Scenario authoring tool</li> <li>➤ Instructional overview guide</li> </ul>	<ul style="list-style-type: none"> <li>➤ In-class theme-based training</li> <li>➤ Three CTA driven scenarios</li> <li>➤ Facilitator guide</li> </ul>

### **Global Response: Large Scale Interagency Training**

The Red Cape: Crisis Action Planning training program centered on training crisis response skills to Army, Army National Guard, civil-military, and other agency partners but did not extend to multiple agencies responding at a national level (Schaefer et al., 2008). In addition, Red Cape training requires students to assemble in a single location, which does not provide a suitable format for training at a national level. Thus, Red Cape was extended to address these needs by creating a distributed web-based training program and by evaluating and expanding Red Cape training to address issues relevant to multiple agencies responding to situations at the national level.

The main objectives of the Global Response research were to refine and expand the existing Red Cape expert themes and to use existing technology to facilitate online, collaborative training with partners from diverse agencies and nations. Our purpose was to train leaders to be agile and adaptive in national crisis action situations, to plan for homeland emergency contingencies, and to support civil authorities while simultaneously reducing the collaborative barriers between the Army and civil authorities. Another purpose was to reduce the cultural barriers between the Army and emergency first responders, allowing for exchange of standing operating procedures (SOP) and exposure to differences in agency language and communication. Our approach was to develop authentic scenarios that emulate the situational factors experts perceive within the emergency response domain in order to foster within students the perceptual and decision-making processes of experts (Ross & Pierce, 2000). Using computer-based, event driven training allows instructors to create scenarios that target specific skills and are appropriate to the level of the learner. Students from multiple agencies can train simultaneously at any time from any place with web access. This allows agencies in various locations to train together without travel or other expenses.

The previous Red Cape training presented scenarios using static slide presentations and Flash<sup>®</sup> animation. This updated version of Red Cape engages students in active vignettes that simulate the fast pace, information overload, and time-pressure of real-world events. Students can train individually with simulated players or as a group. Individually, students learn the tasks

they are responsible for, how information flows in a dynamic environment, and how their actions influence other agencies. In a multi-player environment, students must communicate with other students occupying diverse roles within multiple agencies. This provides opportunities for students to interact and communicate with students from other agencies and discover the requirements and procedures of those agencies.

The Think Under Fire Decisions (TUF-D) training program, developed for the National Guard Bureau, was used to create an environment for presenting training scenarios. The TUF-D is a collaborative, distributed, web-based training program that presents scenarios to command-level responders and allows users to train as individuals or as teams (see Appendix A). The system is the follow-on to the Automated Exercise and Assessment System (AEAS) developed to deliver simulated multi-role exercises in a networked environment. The system was modified to support current multi-agency command-level decisions in emergency operation situations. The TUF-D enhances Red Cape training by allowing personnel from multiple organizations or agencies to train together asynchronously and/or synchronously in a common scenario.

This system trains individuals at their appropriate skill level by focusing on the three phases of learning defined by Bloom's taxonomy: knowledge, skills, and abilities (Bloom, 1956). Each phase provides the user with a different learning experience but draws from a single knowledge database to ensure consistent training.

- In the Knowledge phase, students are exposed to accepted doctrine in the domain. This exposure teaches students the basic concepts and shared vocabulary of the domain. Learning is accomplished through classic presentation-based training.
- In the Skills phase, students transform knowledge into behavioral demonstrations of the material. Students start to build a repertoire of experiences that form mental models. Learning is accomplished through individual computer-based simulation. In TUF-D, individual students interact with simulated team members. Students may try different roles within the simulation to gain an understanding of the responsibilities of their team members.
- In the Abilities phase, students execute their roles as a team in a collective simulation-based exercise. Learning in this phase is accomplished through team computer-based simulation. In TUF-D, individual students perform tasks that influence other team members and must react to the actions of other live players. Team exercises teach students about each other's roles, abilities, responsibilities, and lines of communication.

One advantage of this training is that it helps students build a pattern base or mental model to make better recognitional decisions when real world challenges arise. The system assesses all phases of learning by drawing from a single knowledge base, which provides consistent training across multiple presentation methods and levels of experience (Pigora, Tamash, & Baxter, 2006).

## **Method**

### *Participants*

Participants were 29 active duty Army personnel who had experience responding to national, multi-agency crisis events. They participated in interviews and two focus groups. In addition, 14 National Guard personnel from Camp Atterbury, Columbus, IN, and 12 personnel from the Indiana National Guard, Indianapolis, IN participated in interviews and two focus groups. Participants, including a Joint Task Force Commander during a hurricane federal response effort, staff officers in Northern Command, staff members for the Defense Coordinating Element, Region VII, and members of the Indiana Homeland Security and Army National Guard, participated in telephone interviews.

### *Procedure*

The research built on the Red Cape research program by interviewing crisis management experts from the civilian and military community about the ability of military, civilian, and non-governmental agencies to work together in response to large-scale, crisis action situations. The interviewers utilized an interview guide based on CTA methodologies with a focus on the critical decisions and tasks present during multi-agency emergencies. Subject-matter experts (SME) were interviewed about specific multi-agency incidents in which they faced decision challenges and struggled to understand and/or resolve crises. Interviews also focused on identifying training issues relevant to crisis action planning and execution including joint, national missions (see Appendix B). The goal during these interviews was to identify the critical cues and factors necessary during the sensemaking processes and the essential tasks that contribute to effective response during crisis events. The information gleaned during the interviews was invaluable during the development of scenarios that addressed the training needs of diverse civil-military organizations.

In addition to conducting CTA interviews in Indiana, SOPs and other materials were collected in order to understand operating process and to develop realistic vignettes. From the CTA data and other documentation, the research team developed exemplar scenarios by constructing story lines, identifying multiple decision points, and incorporating the multiple strategies used to resolve each event. The three scenarios were an earthquake, a bombing, and a riot at a political convention. The information was incorporated into scenarios as injects (key events to stimulate an action or response). Each inject has associated consequences (multiple branches) that lead to logical follow-on events. This training structure allows for deliberate practice with focused tasks and instant feedback.

### *Analysis*

Data from each interview was categorized by matching information gathered from the participants to the definitions of the original Red Cape themes. In addition, categories for scenario and inject ideas, explanations of agency-specific procedures/roles, and training suggestions for use in scenario development were documented. Spreadsheets were utilized to categorize the interview data into each theme or category; each row contained data from one



interview. Placing each piece of information into the appropriate cell by matching it with a theme or category definition allowed researchers to gauge the amount of information in each category, by participant and by comment. The categorized information resulted decision requirements tables (DRT). The DRT categories were Decision Point, Why Difficult, Cues/Factors, Strategies, and Novice Errors.

For example, the list below contains the categorized interview data for the original Red Cape theme See the Big Picture.

1. Some people are not capable of seeing the big picture.
2. Use geographic information system (GIS) to get a big picture view.
3. New commanders do not understand the system so they cannot see the big picture.
4. Think about the impact of your actions beyond the immediate threat.
5. Can create a bigger problem by trying to solve the problem.
6. Cannot just act without considering public reaction.
7. It is easy to be overwhelmed by events and get tunnel vision.
8. Worrying about small things during a large crisis is not seeing the big picture.
9. It is difficult to see past observable facts and piece together cues.
10. Make sure people know your weaknesses and information needs.

The data was then mapped onto a DRT under the updated theme see the big picture and predict events (see Table 2).

Table 2

*Decision Requirement Table of Data Categorized Under the Theme “See the Big Picture”*

Problem/Decision	Why Difficult?	Cues/Factors	Strategies	Novice Errors
Maintain big picture view	5. Can create a bigger problem by trying to solve the current issue 6. Can't just act without considering public reaction 7. It is easy to be overwhelmed by events and get tunnel vision 9. It is difficult to see past observable facts and piece together cues	8. Worrying about small things during a large crisis, is not seeing the big picture	2. Use GIS to get a big picture view 4. Think about the impact of your actions beyond the immediate threat	
Know people's strengths and weaknesses	1. Some people are not capable of seeing the big picture		10. Make sure people know your weaknesses and information needs	3. New commanders do not understand the system so they cannot see the big picture

## Results and Discussion

The interview data revealed the individual knowledge and skills critical to effective decision-making in rapidly changing crisis action situations and differentiated the critical tasks and skills required for each role and agency. From these interviews, new decision patterns were identified, the initial nine Red Cape themes were refined, and a list of vignette situations was created.

The categorized information generally fit the original Red Cape themes, however, close analysis indicated that clarification and reorganization of some themes was necessary. Based on the original definitions, some themes such as *think in shades of gray* and *model a dynamic situation*, had very little information categorized into them from the interviews, thus these themes were consolidated into other themes. The data drove the formation of three new categories: communication, coordination/synchronization, and sensemaking/information gathering. All the existing and new themes described one of three different cognitive processes: Assess, Synchronize, and Execute. These processes involve activities that cross over all themes, such as leveraging established relationships and establishing a battle rhythm. They serve to link together the themes into an evolving response pattern of interdependent actions characterized within the themes (for detailed process and theme definitions see Appendix C).

### *Updated Themes*

Below is a list of the update Red Cape themes for each process (Assess, Synchronize, and Execute).

- Assess:
  - Collect and assess information and understand the situation: Effective commanders and staff are able to determine quickly how and where to collect information necessary to develop a situational understanding.
  - See the big picture and predict events: Effective commanders and staff construct a coherent picture of unfolding events and see the overarching implications of possible actions.
- Synchronize:
  - Coordinate and communicate internally and externally across all agencies: Effective commanders and staff collaborate within and across agencies in a manner that develops a shared understanding of the mission and of responder roles, while enabling the synchronization of mission goals and objectives.
  - Acquire, prioritize and allocate assets: Effective commanders and staff determine the type and amount of equipment and personnel necessary to accomplish the mission.
  - Establish chain-of-command: Effective commanders and staff make clear to all personnel who is in charge of an incident and which staff or agencies are responsible for various actions.
- Execute:
  - Recognize decision points: Effective commanders and staff recognize the point in a crisis when they need to make a decision.

- Address public and responder needs: Effective commanders and staff notify the public and media about the situation and relevant events.
- Maintain mission priorities: Effective commanders and staff recognize that their primary mission is to protect human life and property, while insuring the safety of incident responders.

Table 3 shows the match between the updated and original themes. New themes were created to account for the data and combined some original themes to reflect one updated theme. The definitions for the updated themes incorporated all the original themes and their associated cognitive skills.

The interviews revealed several observable behaviors associated with each theme. For instance, someone who is seeing the big picture and predicting events will display behavioral indicators such as:

- focusing on larger concerns, rather than deliberating over only small matters,
- taking into consideration the consequences of their actions to outside agencies and the community,
- making interpretations beyond observable facts,
- creating a story from small bits of information,
- focusing on more than just one aspect of the situation,
- taking effective action when new information comes in, and
- setting a clear battle rhythm and maintaining motivation.

Table 3

*Comparison of Updated Themes to Original Themes*

Updated Themes	Original Themes
<b>Assess</b>	
<ul style="list-style-type: none"> <li>• Collect and assess information and understand the situation</li> <li>• See the big picture and predict events</li> </ul>	<ul style="list-style-type: none"> <li>• See the big picture</li> <li>• Think in shades of gray, not black &amp; white</li> </ul>
<b>Synchronize</b>	
<ul style="list-style-type: none"> <li>• Coordinate and communicate internally and externally across all agencies</li> <li>• Acquire, prioritize and allocate assets</li> <li>• Establish chain-of-command</li> </ul>	<ul style="list-style-type: none"> <li>• Use all available assets</li> <li>• Keep the chain-of-command flexible</li> </ul>
<b>Execute</b>	
<ul style="list-style-type: none"> <li>• Recognize decision points</li> <li>• Address public and responder needs</li> <li>• Maintain mission priorities</li> </ul>	<ul style="list-style-type: none"> <li>• Plan for and recognize decision points</li> <li>• Reprioritize as necessary</li> <li>• Model a dynamic situation</li> <li>• Understand the public need</li> <li>• Maintain focus on mission priorities</li> </ul>

The behavioral indicators were extracted from the DRT data (see Table 2). Data categorized into the Why Difficult section, such as “it is difficult to see past observable facts and piece together cues” indicates that someone who is making interpretations beyond observable facts is displaying the behaviors defined in the see the big picture theme. Observable behaviors might be a staff member who receives a small bit of information, but takes action that indicates he/she has a broader interpretation of that information. For example, one participant recounted an incident when he was looking into a suspicious truck and noticed wires sticking out from under the seat. He instantly backed up, evacuated the area, and called a bomb squad. He took a small amount of information (the wires) and made an interpretation beyond observable facts (a bomb). (See Appendix C for the behaviors associated with each theme).

### *Scenario Creation*

Scenarios tailored to emergency response at a state-level National Guard Joint Operations Center (JOC) were created by combining input from government, military, and support personnel. The vignettes were developed using the Indiana National Guard JOC as a setting because of their ongoing sponsorship during this research and because of their close proximity to the research team. After identifying the themes, expert behaviors for each scenario were identified using subject-matter experts from the Indiana National Guard and their civil-military, interagency partners. An instructional training approach was developed that required students to apply the themes within a simulated event. To create scenarios that fit the cognitive and physical skills of expert responders, the following scenario development requirements were considered.

- Scenarios must exercise the skills required to meet training objectives.
- Scenarios must be realistic. If not, students will not be motivated, and it will be difficult to transfer skills (i.e., from a simulation into real-world situations). Realistic scenarios include probable real-world events, realistic duties, tasks, and interactions with teammates, along with believable documents, news reports, and orders.
- Scenarios must match students’ background knowledge base. Because training is usually conducted under time constraints, students should spend minimal time learning about the background scenario and spend maximum time applying their knowledge (first phase of Bloom’s Taxonomy) to events in the scenarios. Various strategies exist to minimize background knowledge across scenarios:
  - keep storyline structure and background knowledge constant across scenarios,
  - create a realistic, but simplified, set of situations, and
  - rely on known, existing situations to create scenarios.

The scenario concepts were derived from incidents suggested during the CTA interviews. The three general scenario storylines were an earthquake, a bombing, and a riot at a political convention. The storylines were selected, in part, because participants expressed a need for training to respond to uncommon natural disasters such as earthquakes, more experience handling terrorist events, and more experience responding to atypical, unplanned events, such as a riot. Critical crisis response skills were extracted from the data and a strategy was developed to determine how best to represent the skills in the scenarios. During either face-to-face meetings or teleconferences, ideas were identified for each vignette. Each vignette was scripted in storyboard format and appropriate maps, documents, photos, information, overlays, and visual

cues relevant to that event were identified. After storyboarding the scenarios, SMEs provided key considerations and possible solutions to the challenges presented in the scenarios and described the actions they might take to resolve the situation. In-house and external personnel reviewed vignette drafts and provided feedback. The review process was completed several times before completing the final product.

### *Creating Training in TUF-D*

The existing TUF-D training tool was used to create the training based on the Global Response research objectives. The TUF-D is a simulation-based training system that allows individuals or teams to make decisions in realistic situations and experience the outcomes. It immerses users in scenario-based exercises by presenting e-mail, simulated telephone calls, website news stories, video clips, and other multimedia communications that resemble current environments. The TUF-D is completely web-based with no software install. Users make decisions and mitigate incidents by responding to messages, communicating with teammates, and giving commands to simulated entities.

The TUF-D was designed with an interface familiar to users in order to minimize the training necessary to use the system (Figure 2). By creating an interface that resembles a standard Windows desktop, including realistic e-mail, a recognizable instant messenger program, and familiar documents, specialized interface instruction was reduced. In addition, the TUF-D map display uses the Google Maps interface with scenario icon overlays to show populations, resource positioning, facilities, and critical information. The user may also choose to receive multimedia inputs as video, with or without closed-captioning. To further assist users, a user-guide with a step-by-step tutorial on how to set up and run a training session was developed. The guide provided users with a help option during the simulation. The user guide also provides definitions of the themes and an explanation of how and why theme-based training is useful for building the mental models necessary to excel in crisis.

The TUF-D development for this project encompassed two new areas of functionality: Voice over Internet Protocol (VoIP) communications during the exercise, and a Scenario Authoring Tool. The Authoring Tool is discussed in the “Implementing Unique User Requirements and Transitioning Red Cape Training” section of this report.

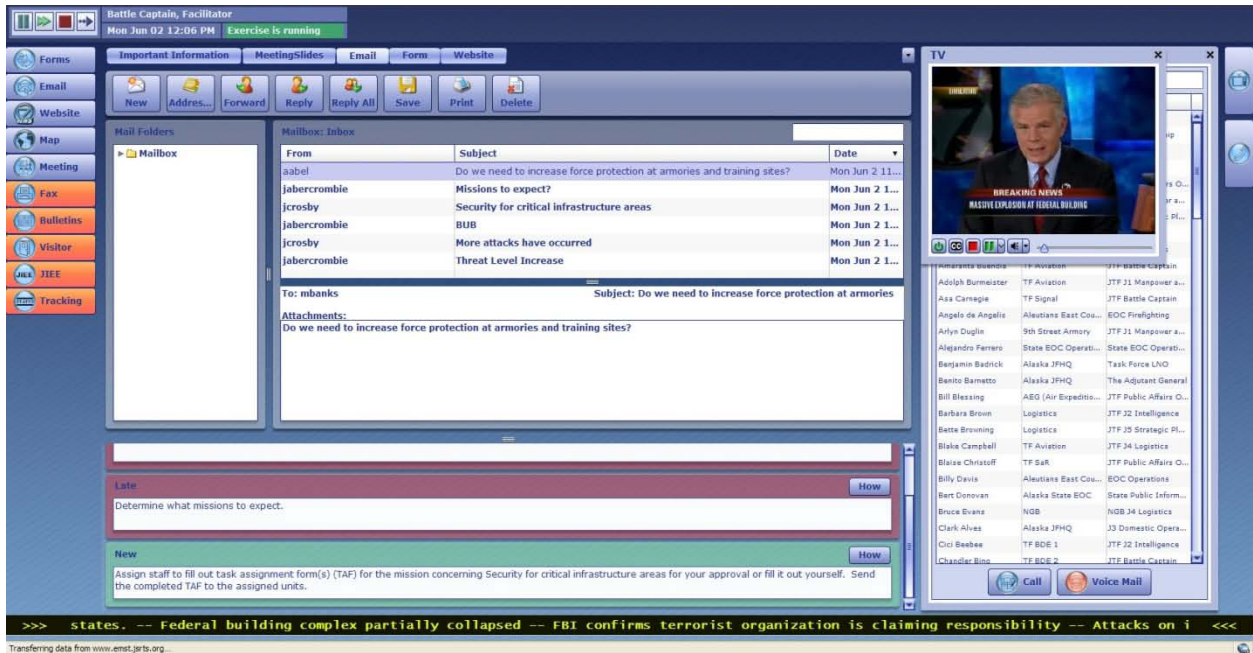


Figure 2. TUF-D interface.

## VoIP

One goal of this research was to provide VoIP communications to participants in distributed locations. The VoIP provides several advantages for the TUF-D system as a whole, thus our requirements analysis included both requirements addressed in this research and some requirements that are beyond the scope of this effort. The requirements for the current researcher were:

- Interface:
  - connect two players in a simulated “telephone call” during a TUF-D exercise,
  - connection requires no more interface overhead than does current simulated telephone calls with simulated players, and
  - ability to pick a telephone call topic for use in task assessment.
- Software:
  - ability to integrate with a Flash-based interface,
  - ability to support point-to-point connections,
  - no client install, and
  - use of computer speakers and microphone for capturing and playing audio.

The requirements for future research were:

- Software:
  - ability to support “conference call” connections,
  - record audio (server side) for After Action Review, and

- ability to add server-side plug-ins to process data (e.g., support speech recognition for task assessment).

Several VoIP server options were surveyed, including: Adobe Flash Interactive Server, Wowza, Mumble/Murmur, FreeSwitch, Red5, and Adobe Pacifica. The Adobe products and Wowza were capable but had licensing fees. Red5 encompassed all the functionality needed in an open source server. Because Red5 was the server previously selected for TUF-D video streaming, it was easy to add the VoIP support to our existing video server setup.

### *Performance Assessment*

The training system provides ongoing feedback during training and an after-action review at the end of the simulation. Assessment of learner performance occurs through four mechanisms.

1. Knowledge Trainer. To enhance basic knowledge, the training contains a built-in web-based training presentation system that presents content and quizzes students.
2. Direct Feedback. Simulated and/or live role players provide timely and contextual feedback to students during the training scenario. This feedback comes in the form of information and requests that reflect the consequences of students' previous actions. This feedback requires students to take action to remedy the situation.
3. Posted Questions. Facilitators can post direct questions to students. They can ask questions at any time during the scenarios in order to measure students' situational awareness, identify their decision processes, and provide feedback about actions taken.
4. After Action Report. Upon completion of the training scenario, the students and facilitators receive detailed after action reports (AAR) containing all of the actions taken/not taken during the simulation (Figure 3). The AAR outlines student accomplishments and provides feedback about their overall performance within the training. Students and facilitators can sort the AARs by time or by theme. From this information, instructors can evaluate which tasks students performed well and which tasks they showed weak performance. This provides insight into the themes that require extra or focused training. Students receive their own AARs based on individual actions and decisions. Exercise administrators can view separate AARs for each role.

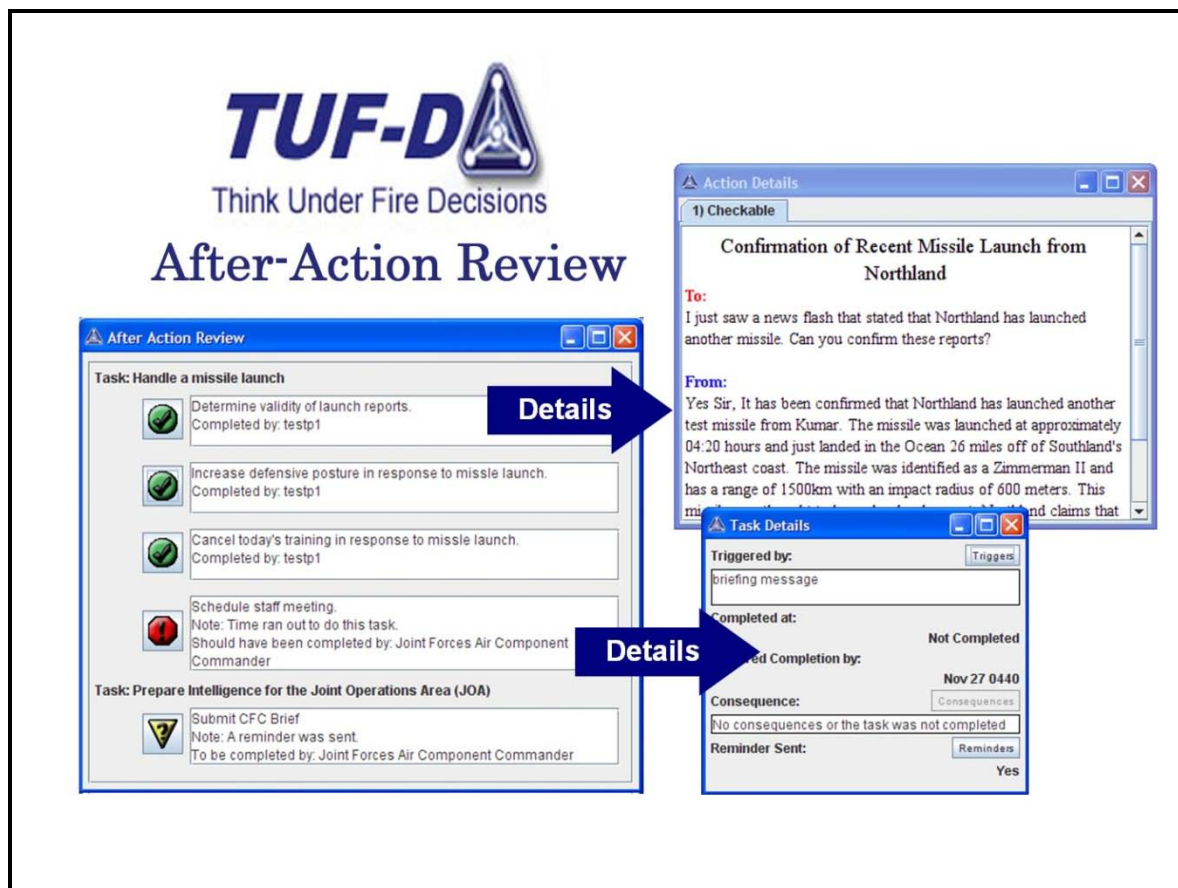


Figure 3. After Action Review.

### Evaluation of Scenarios/Training

In order to determine the effectiveness of the scenario creation tool and the training program, an evaluation of both the system and the training content was conducted.

#### *Method*

**Participants.** Twelve National Guard members with experience in Emergency Operations Center participated in the evaluation. Members of the staff included Soldiers and civilians from the various response cells including the G-3, EOC Director, G-4, Provost Marshall, Safety Officer, and other staff agencies. The same participants attended two days of evaluation.

**Procedures.** The evaluation occurred during two 3-hour sessions held on separate days. These sessions included instruction on and practice with training system. Activities on Day 1 included an overview of the themes and the scenario learning objectives, instruction on the use of the training simulation program, participation in a simulation session, questionnaires and discussion. Activities for Day 2 included an overview and instruction of the scenario creation tool, guided practice using the tool, user creation of scenarios using the tool, and questionnaires



(further discussion of Day 2 takes place in the “Implementing Unique User Requirements and Transitioning Red Cape Training” section).

Prior to starting the session on Day 1, all participants read and signed informed consent forms. Participants positioned themselves where they could see the screen of one of the government furnished laptops used in this evaluation. Participants were introduced to the research objectives and provided with a detailed explanation of the purpose of the evaluation activities. Participants then received an explanation of theme-based training and a quick briefing on how to operate the training system. After a 30-minute hands-on training session, the research team observed participants as they completed the earthquake scenario exercise.

During the exercise, the TUF-D encountered some technical problems that interrupted the session until the problem was resolved. The primary problems included intermittent VoIP, particular features not operating, and instances when the system locked-up. The technical problems were attributed to server updates that were being completed at the time of the exercise during an iterative development schedule.

### *Results and Discussion*

The exercise presented issues and problems to participants that were well above their usual scope of responsibility. Even with the technical problems identified above, the research team was able to observe the participants operate the system and draw conclusions about its use in training. Results from this evaluation include participant comments, observations made by the research staff, and data from questionnaires about the training.

The following comments about the training tool represent those made by the evaluation participants.

- Participants generally liked the features of the training tool and expressed interest in using it to train in the future. They commented that EOC response teams normally do not have the opportunity to train or work together until a real-world crisis occurs. They thought they would use the system to do distributed desktop exercises in order to improve ability to work together.
- The participants particularly liked the e-mail and telephone call features. Although there were intermittent issues with VoIP, the participants still tended to use the telephone feature.
- The participants liked the ability to run individual exercises. Due to their OPTEMPO (Operational Tempo) and the difficulty of assembling everyone at one time, the individual training feature allows students to train as their schedule allows. Participants said this feature would create a better-trained staff.
- The participants recommended that the system incorporate a feature that allows them to input their internal reports and administrative documents easily (e.g., SOPs, operation orders (OPORD), message formats, and briefing formats).

Eight participants completed a short questionnaire about the training program (see Appendix D). The questionnaire contained Likert-type scale ratings and short answers.

Participants rated their perceived improvement in performance and rated items pertaining to the training exercise. Short answer questions pertained to expectations, realism of training content, and usefulness as a training tool.

Ratings pertaining to participants' perceived improvement in their performance averaged 3.47 on a 5-point Likert-type scale (1 = none; 5 = exceptional). Participants gave the lowest average rating ( $M = 3.25$ ) to the item "Maintain focus on mission priorities." The highest average rating ( $M = 3.75$ ) was for item "Assess the situation and select the best course(s) of action." These ratings indicate that participants saw a moderate to substantial improvement in performance.

Participants rated comments about the training simulation content and the tool. The mean rating was 4.13 on a 5-point Likert-type scale (1 = strongly disagree; 5 = strongly agree). The item with the lowest average rating ( $M = 3.13$ ) was "I have worked harder during this exercise than in most exercises I have participated in." Although this average was in the "agree" category it is still low considering the participants were engaging in an exercise created for higher-level JOC commanders. It may be necessary to adjust the difficulty level of these and/or future scenarios to match the skill level of students. The highest average rating ( $M = 4.75$ ) was for item "I would participant in training using the simulation in the future." This provides encouraging feedback about the interest future participants will have in using this tool. Participants provided this positive rating even after experiencing technical difficulties with the tool. Most participants rated the simulation environment as realistic ( $M = 4.13$ ), and all participants highly recommend this tool be incorporated into training/education courses ( $M = 5$ ).

Some comments to improve the simulation included:

- the system combined all elements of a realistic simulation except for radio traffic,
- the system should provide clearer expectations of each role and assets available, and
- it is a good system, but needs longer modules.

Positive feedback included:

- the training system helps operators crawl, walk, run;
- very realistic and detailed training;
- the ability to tailor training to specific needs and roles is excellent; and
- the ease in which the users can modify the program is valuable for training purposes.

### **Global Response Conclusions**

The TUF-D is a collaborative web-based training product that is compatible with government computers and allows participants in different locations to train and communicate during a scenario. The product includes three multi-agency national response scenarios containing challenging and realistic events. Along with the scenarios, the system provides an instructional-overview guide that describes the specific behaviors trained within the scenarios and provides facilitator guidance to increase the level of feedback students receive. Included in

the instructional-overview guide is a user guide with step-by-step instruction for operating and using the training system.

The CTA findings provided a rich data set that allowed for the development of an authentic and contextually rich simulated training environment for Army and civilian agencies who must collaboratively respond to large-scale crisis events. The interface replicates the real-world decision environments of responders operating in JOCs (or EOC). By presenting a desktop-style decision space, responders have to select tasks and interpret information as they would in real situations, without the ability to view the scene directly and with information filtered through on-scene responders and the media. In the face of uncertainty and a large amount of ambiguous and missing information, it is vital that these responders be able to visualize current and future events and engage in adaptive thinking as information comes in and the situation changes. .

The original Red Cape themes were updated based on the results of the present research. While the context in the updated themes match the original themes, the new theme categories, and the identification of overarching processes provides clarity and greater distinction between the theme definitions. The data provided behavioral indicators associated with each theme. These indicators will assist training developers and students as they develop training and evaluate performance.

### **Implementing Unique User Requirements and Transitioning Red Cape Training**

By developing a rapid modification tool for the web-based collaborative training platform, scenario developers are able to tailor their emergency response training. Tailorable training prepares leaders with up-to-date training, provides advanced skills in novel situations, and shortens the time from skill deficit to training results. The research resulted in a training product that addresses the growing number of critical coordination challenges and cultural differences present in multi-agency environments, such as differences in mission objectives, types of resources available, operational vernacular, SOPs, areas of interest, proximity, and jurisdiction. With the ability to develop scenarios targeted toward specific training goals, trainers can specify learning objectives and identify the outcomes they will use to evaluate skill development. This approach provides a structured method to address the challenges surrounding multi-agency responses to national crisis events.

The purpose of the Implementing Unique User Requirements and Transitioning Red Cape Training research was to develop a rapid, web-based scenario development and collaborative training tool along with an instructional overview guide to assist scenario developers in understanding, developing, and presenting theme-based training to support both individual and collaborative training. As with the Global Response research, the TUF-D software architecture was utilized to create an authoring tool that allows users to create or modify scenarios to address the training needs in the operational environment. An instructional-overview guide was developed to explain theme-based training and provided users with guidance on how to create using the authoring tool. By focusing on specific themes, training developers can create scenarios that target specific skills and adjust conditions to suit user needs. The development/modification tool was developed specifically for training developers and training

administrators. The goal of the tool was to reduce the workload of training developers and administrators when creating and modifying Red Cape vignettes and scenarios. The online help system walks developers and administrators through the vignette creation process and provides access to help screens and instructional aids. Developers and administrators can access previously created scenarios and modify them to fit their current training needs.

## **Method**

### *Procedure*

The TUF-D did not contain a Vignette Creation Tool prior to this research. An authoring tool for was developed in Adobe Flex®. The tool uses a thin client architecture—meaning it does not require software installation by the user. The Vignette Creation Tool was fully integrated into the TUF-D portal. In creating the tool, the manual scenario creation process used in previous research was adapted into a self-contained, step-by-step, semi-automated scenario development process.

The design and development of the instructional-overview guide was based on systematic instructional systems design (ISD) principles (Houser & DeLoach, 1998). Content was designed to promote active engagement, encourage self-reflection, and convey the personal relevance of knowledge. Similar to the TUF-D interface, the instructional-overview guide interface was designed with a look familiar to most users. The interface resembles an academic-style textbook sitting on a desk. Each page incorporates a variety of text-based instruction and interactive flash-based objects to accommodate different types of learners. Text, interactive graphics, and videos accommodate the visual learner and audio-based graphics for the auditory learner.

In addition to considering learner types, the text-based and interactive content was designed using the following seven principles of design (Houser & DeLoach, 1998).

1. Contrast is the difference in values, colors, textures, shapes, and other elements. Contrast creates visual excitement, increases interest, and places emphasis on content.
2. Emphasis is creating a center of interest for the viewer. The center of interest attracts attention to emphasize its importance compared to the other elements in the composition.
3. Balance is the appearance of visual equality in shape, form, value, and color. Balance can be symmetrical, asymmetrical, or radial.
4. Unity aids in the design of the instruction by harmonizing sections and providing content cohesion.
5. Patterns are art elements that use planned or random repetition to enhance composition and increase users' visual experience.
6. Movement is the visual flow of the content by object placement and position throughout composition.
7. Rhythm is the repetition of visual movement in terms of color, shape, and lines.

HyperText Markup Language (HTML) was used to develop the instructional-overview guide interface and Adobe Flash® was used to create customized interactive objects, graphics, and video. Each text-based and interactive component was designed using the six elements of

design: color, value, texture, shape, form, and space (Anderson, 1961). The six design elements compliment the seven principles of design used to create the text-based and interactive content.

## Results and Discussion

### *Vignette Creation Tool*

The Vignette Creation Tool allows users to create new or edit existing vignettes (Figure 4). When creating new vignettes, users specify the domain and roles they want to train and create timelines for their vignettes. Vignettes are typically broken down into one or more time segments. Time progresses during segments in real time. Once participants have addressed all injects within a segment, they can fast forward in time to the next segment. When creating scenarios, users place injects on the vignette timeline and specify the parameters. For injects requiring support files (e.g., html, pdf, or video files), users can either upload files, or browse a repository of reusable injects on the server.

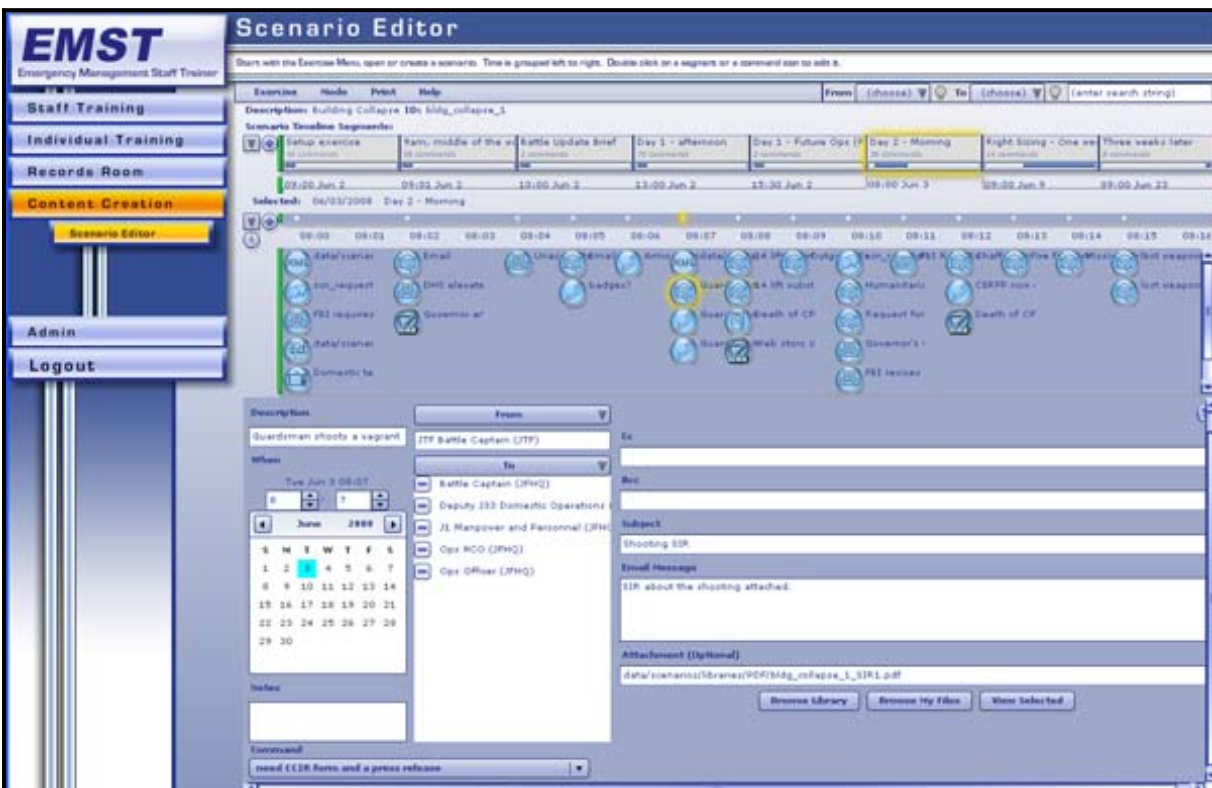


Figure 4. Vignette creation tool.

The following inject types are available through the Vignette Creation Tool.

- Important Information: This html page displays when it is sent from the simulation. This page typically displays an introduction before the start of the vignette.
- TV show: Typically a short video news story. The video streams to users' computers.

- News website articles: Displays an html article containing text and images.
- Fax: Displays an html file in a fax-type format containing relevant information.
- Bulletin board postings: Html displays. These typically contain previous warning orders (WARNO), Fragmentary orders (FRAGO), commander critical information requirements (CCIR), essential elements of friendly Information (EEFI), and anything else staff might post on the walls of the operations center.
- Email messages: Incoming Outlook-style messages. They may have a pdf attachment.
- Telephone calls:
  - free response—the user can type in any response, and
  - question-based—the user is asked one or more multiple choice questions. The answers are part of the assessment.
- Office door interaction: Users must answer knocks at the door to see an image and text. Users generally use this feature to show interaction with a simulated person at the scene. The simulated entity may ask multiple-choice questions, or ask for input on a form, such as a press release. The author may also specify a free response text area.
- Meeting interfaces.
  - Simple meeting interface: The user selects whether to attend the meeting or not. The meeting pops up as a pdf of PowerPoint slides.
  - User input meeting interface: Depending on the role played, a simulated or real player may ask users to fill out their slide for an upcoming briefing (e.g., Fill out the J1 slide for the upcoming Battle Update Briefing). At briefing time, the user selects whether or not to attend the meeting. At the meeting, the system presents the set of slides filled out by live and simulated players.

The Vignette Creation Tool allows authors to specify the tasks they want to evaluate. Authors may link the tasks to Red Cape themes. They can do this in the assessment section of the authoring tool. If authors assign themes to each task, they can evaluate performance based on the themes in the AAR. It is possible to add new modules to the training software to exercise different military, municipal, state, or federal organizations. Team training modules can be executed together to enable collaborative exercises with multiple organizations. Roles, tasks, scenarios, and assessment criteria are in files and users can easily alter them without modifying the source code. This flexible design allows for easy prototyping and modification of roles, scenarios, and questions. Components of scenarios include pre-deployed resources, locations for critical events, and a timeline of situations that contain simulated email messages, videos, audio clips, text messages, still images, and other informational media.

### *Instructional-Overview Guide*

Organizations frequently do not understand the capability gaps that exist between mission requirements and training requirements and, although they may often train crisis action response, they do not include the skills that experienced responders use to resolve crises successfully. The Instructional Overview was created to include information about the importance of capturing and accurately portraying expert decision processes within scenarios. The goal of the guide was to

provide trainers with an introduction about how to implement the Red Cape Training program and how this method leads to improved performance.

An interesting and informative instructional-overview guide is essential when presenting the capabilities, strategies, and usefulness of a training package to users. This guide contains video, animations, and narrations to keep the audience attentive and to appeal to a variety of learning styles. The instructional-overview guide incorporates the principles of immersion and engagement to ensure that users focus on the foundational content pertaining to crisis response and interagency collaboration. The guide presents the theme-based training methodology and provides definitions of the updated themes along with expanded explanations and behavior indicators of each theme. The instructional overview guide also provides detailed instruction for operating the authoring tool and running exercises. In addition to the instructional overview guide, the authoring tool has a built-in multimedia help system that provides guided instruction about how to create and edit vignettes during the development process.

### *Scenario Generation*

The research to develop a scenario generation tool achieved two purposes. First, an authoring tool was created to rapidly develop and modify training scenarios. Second, the newly created authoring tool was utilized to create the scenarios for the Global Response exercises. Using the authoring tool to develop our own exercises allowed the research team to test and modify the tool throughout development.

Scenario developers learned to use the tool and create scenarios during teleconferences and face-to-face meetings. During meetings, scenario storylines were discussed and development issues were addressed. After several meetings the scenario development team began loading injects to create the scenarios. The team met to brainstorm ideas for each scenario based on incidents described by participants in the CTA interviews. The team developed a basic outline of each vignette with a focus on selected emergency response themes. Once the outlines were prepared, storyboards were produced that described the events to take place during each scenario along with the injects, dialogs, and multi-media required to create the story. The storyboards were tailored to fit the required activities for each role in the TUF-D scenario development tool. The purpose of these injects was to create complete, multi-player scenarios that drive students to take actions in response to the crises. The TUF-D allowed the scenario development team to input injects to appropriate staff sections and ensure that each scenario addressed the themes. After creating the scenarios, they were tested to ensure they were complete, accurate, and realistic. The review process occurred several times before products were finalized. During the iterative process, military SMEs reviewed the materials and made suggestions and recommendations as the tool evolved to the final product.

## **Evaluation**

### *Method*

The purpose of the evaluation was to test the Scenario Authoring Tool. Evaluation participants identified issues that would need to be addressed in order to improve the application.

*Participants.* The same participants who attended Day 1 of the evaluation and evaluated the Global Response training also attended Day 2 to evaluate the authoring tool.

*Procedures.* Participants attended a three-hour session on Day 2 of the evaluation. Activities for Day 2 included an overview and instruction on using the scenario developer, guided practice using the scenario creation tool, participant creation of scenarios using the scenario creation tool, and questionnaires.

At the start of the evaluation, participants sat in view of a laptop computer and received brief instruction on the scenario development features of the training system. After instructors provided participants with a quick overview of their experiences developing scenarios for the Global Response training, participants were provided a “train-the-trainer” session on how to develop a scenario. As part of the session, the participants, with facilitation from the research team, brainstormed and identified actions that are critical to perform in crisis response situations. As participants created scenarios using the tool, the research team provided insight on Tactics, Techniques and Procedures (TTP) used to develop the Global Response scenarios. During the guided practice portion of the evaluation, participants were split into two groups. One group brainstormed ideas and generated injects for one timeline segment. The second group created injects by using the information created by the first group. All participants had hands-on experience loading injects into the scenario creation tool.

### *Results and Discussion*

The participants generally had no problems loading injects into the system. They learned quickly how to use the various features to create injects. Even though technical problems occurred while participants were creating scenarios, they frequently commented about the benefit of the authoring tool. Evidence of their favorable response was apparent when they asked the research team to return in the future to assist them in loading a scenario for use in an upcoming training exercise.

Three participants completed a short questionnaire about the scenario creation tool. This questionnaire contained Likert-type scale ratings and short answers to questions (Appendix E). The low number of respondents can be attributed to delays in the agenda due to technical problems. Participants could not stay late to complete the questionnaire. The data for the three questionnaires are provided with the understanding that the averages are not necessarily indicative of the entire sample.

Ratings pertaining to participants perceived improvement in their ability to develop scenarios averaged 4.13 on a 5-point Likert-type scale (1 = none; 5 = exceptional). Participants gave the lowest average rating ( $M = 3.33$ ) to the item “Conduct an assessment.” The highest average rating ( $M = 4.67$ ) was for items “Identify different types of simulated injects” and “Add, delete, and modify simulation injects.” These ratings indicate that participants understood the notion of injects and how to apply them to scenarios in a useful way.



Participants rated comments about the scenario development tool. The mean rating was 4.67 on a 5-point Likert-type scale (1 = strongly disagree; 5 = strongly agree). The item with the lowest average rating ( $M = 4.33$ ) was “The scenario developer was easy to use.” This relatively low average was due to one participant rating this item as 3 = Neutral. The other two participants rated this item as 5 = *Strongly agree*. The highest average rating ( $M = 5$ ) was for item “I would use the scenario developer in the future.” This provides encouraging feedback about the interest that future training developers will have in using this tool to develop scenarios. Participants provided this positive rating even after experiencing technical difficulties with the tool. With only three respondents, it is difficult to draw specific conclusions or to determine if the entire group of participants had the same general opinion. Clearly, additional data should be collected before any conclusions about participant opinions of the scenario developer tool can be derived.

Only two participants provided short answers. Some responses were that the tool:

- is user friendly,
- has group play interactivity,
- offers quick and realistic training,
- provides a good way to build scenarios for realistic training, and
- helped to gain an understanding of simulator mechanics.

### **Transitioning the Red Cape Project Conclusions**

An instructional overview guide that explains the purpose and benefits of theme-based training and provides instruction on how to use the authoring tool was developed. The guide uses a mix of multimedia to present information. The overview was designed using a modular approach that allows direct access to specific sections and allows users to progress through the guide in a linear or a non-linear fashion.

The help system instructs users on the proper use of theme-based training by providing guided help throughout vignette creation. The guidance encourages users to build authentic scenarios that embed expert themes within the context of the training. The online help system provides clear and concise instruction on how to use the various features, interfaces, and screens to create and modify vignettes. The system does not limit users to the theme-based approach; it provides users with guidance to create a variety of challenging situations.

The result is a synchronized online collaborative training program that supports unity of effort for project development and unit training execution. The end state deliverable trains leaders to understand the capabilities of Red Cape along with the strategies and methods for exploiting them. In addition, the tool allows the Army and the National Guard to tailor scenarios to address current and changing multi-agency crisis response missions.

## **Garrison Commander Training**

As part of the Global Response research, three garrison commander in-class exercises were developed. The purpose was to improve current in-class critical thinking exercises taught at the U.S. Army Management Staff College by implementing a theme-based approach to teach crisis response. The research provided an opportunity to expand our understanding of theme-based training. The objective was to train new garrison commanders to make decisions in ambiguous situations by sorting through information, prioritizing tasks, gathering and allocating resources, coordinating with other agencies, and predicting outcomes. Another objective was to train students to coordinate and synchronize efforts with local civil-military and interagency partners. Three emergency response situations were developed, a train derailment, a bombing attack, and a tornado. The scenarios present a series of incoming reports about the event and the garrison commander students must determine how to manage these events. At various points in the scenario students discuss critical issues and describe the courses of action they would take based on the information presented.

The key to successful learning in these tasks is the facilitation of questions and discussions. A facilitator guide was developed that provides sets of initial and follow-up questions in a manner that challenges students to think analytically about multiple courses of action and to weigh the risks and benefits of decisions while considering situational factors and unexpected events. The structure of these discussions promote thinking skills by placing students into the role of garrison commander and requiring them to respond by giving guidance, making requests, and deciding on courses of action. The exercises focus on theme-based learning. Refer to the Red Cape Themes Overview (Appendix C) for definitions of each process and theme. Each exercise is broken down into segments that present required information to students. Tasks rarely address only one theme, instead they form the complexities present in most emergency environments. Many themes, such as “maintain mission priorities” cross over most or all segments.

## **Method**

### *Participants*

A combination of input of government, military, and research team personnel participated in the development of the scenarios for the training package. Data collected during the 29 Global Response project interviews and two focus groups provided the data used to create the Garrison Commander vignettes. In addition, observations of the Garrison Commander Course, at the U.S. Army Management Staff College, and group interviews with instructors and students were conducted. In addition, the research team interviewed an additional Garrison Commander, one Deputy Garrison Commander, and members of a Garrison and Installation Operation Center (IOC) staff with experience in emergency response. A strong collaborative working relationship was established with the interviewed personnel, providing invaluable insight and access to a garrison crisis response team. Observations of a Garrison Commander and staff were also conducted while they were undergoing a crisis action exercise.

## *Procedure*

Initially, faculty members from the Garrison Commanders Course at the U.S. Army Management Staff College were interviewed to gain a better understanding of the research need. Samples of the materials currently used in the Garrison Commanders Course were collected. Prior to this research, training consisted of PowerPoint slide shows with simple animation and sound effects. The goal of this research was to improve the training received by garrison commanders to improve their ability to respond to crisis response situations by applying the theme-based method.

To create the garrison commander vignettes, an interface architecture that enabled the vignettes to run over the Internet or on a self-contained CD-Rom was developed. The goal of the garrison commander vignettes was to present content that promoted reflection, active engagement, and personal relevance of knowledge. To immerse students in the content, each vignette introduction provides background information and demographics. The vignettes pause at specific points so instructors can ask questions that engage learners, promote reflection, and engage students in discussion. The interface looks like an interactive PowerPoint presentation with forward and back buttons to guide users. Each page incorporates a variety of text-based instruction and interactive flash-based objects to accommodate different types of learners. As with the instructional overview guide design, the seven learning principles and six elements of design to create the text-based and flash-based interactive content were utilized. HTML, Extensible Markup Language (XML) was used to develop the garrison commander vignettes and Adobe Flash® to create customized interactive objects, graphics, and video.

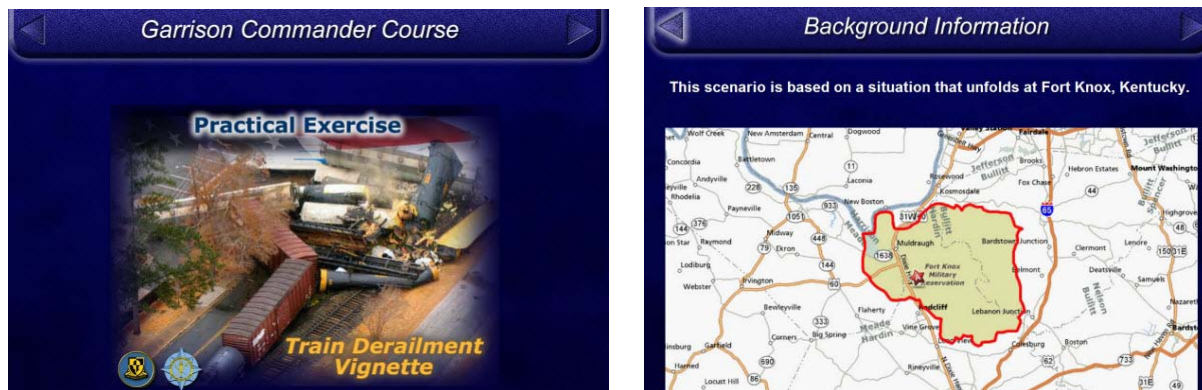


Figure 5. Garrison commander vignette.

## *Analysis*

Results from the evaluation of the current training and a behaviorally science review of the science of learning allowed the research team to identify needed improvements to the existing training garrison commanders received. The following list highlights many of the identified improvements.

- Gaps in skill/knowledge. New garrison commanders often:
  - come from tactical environments and have not been in command of garrison units,

- do not know the language of their new world,
  - are just learning city management,
  - do not know where to go during an event – to the scene or to the JOC,
  - are not clear about what to do in the first hours before help arrives and hours/days after the response effort is underway or over,
  - are unclear on their duties vs. the incident commander vs. the mayor, etc.,
  - do not have contingency plans,
  - are not used to dealing with uncooperative civilians, and
  - do not effectively coordinate with the senior mission commander.
- Garrison commander skill requirements. Garrison commanders need to:
    - develop and manage relationships,
    - work outside the Garrison with other agencies and officials,
    - determine quickly the kinds of problems they need to solve,
    - communicate quickly and effectively with other agencies,
    - know where legitimate authority is, and
    - know what the state EOC plan is so they do not duplicate effort.

## **Results and Discussion**

Comprehensive storyboards and scenarios for three crisis action vignettes were developed. The storyboards centered on training goals and learning objectives identified from the interview data. Challenges and critical decision points based on the CTA interview data were embedded in the scenarios. The setting for the three garrison commander vignettes was Fort Knox, KY. The Fort Knox Garrison staff and the Fort Knox IOC provided guidance and assisted the research team in gathering images for the scenarios. Creating scenarios using one operational location reduces the amount of background information students must keep track of as they work through multiple scenarios. The background information is the foundation upon which new information is considered. To immerse students in a situation, students receive frequent Battle Update Briefs (BUB), or staff update briefings, to present information to the garrison commanders. The detailed briefs included many of the cues students need to visualize the situations presented in the vignettes. The information provided at the beginning of the vignettes is the foundation upon which students consider new information.

### *Scenario Creation*

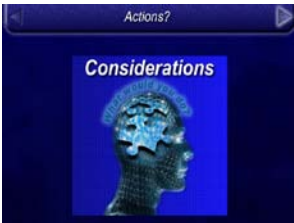
The scenario content was derived from incidents described in the CTA interviews with garrison commanders and other military/civil emergency responders. Information and content from U.S. Army Management Staff College products and from consultation with the Fort Knox IOC personnel were used when possible. After determining the crisis response skills and associated themes, the scenarios were developed to represent the required skill development.

To create the garrison commander vignettes, the team met in person to brainstorm scenario content. Basic outlines for each scenario were created, the scenarios on storyboards were scripted, and appropriate media content, such as maps, overlays, and visual cues were determined. Various members of the team reviewed the scenarios and revised as necessary.

After completing the storyboards, critical thinking questions and discussion points for each section of the scenario were created. The research team and military SMEs reviewed the scenarios and questions and provided feedback. The review process went through several iterations before the final product was completed.

### *Facilitator Guide*

The facilitator guide is structured the same for each of the three exercises. A scene description provides a high-level account of the scenario. Following the description is a discussion about the major themes addressed in the exercises. Each segment contains critical thinking questions and a variety of discussion points. Facilitators encourage students to take notes during the presentation so they can use the information to answer questions later. Taking notes teaches students to listen for and remember useful information while events are unfolding. The guide contains a large number of discussion points that address a variety of teaching points. Facilitators can pick from the discussion points or create their own, based on the material they want to highlight. Figure 6 shows an exercise segment, accompanying questions and discussion points.



*The time is 1315 and the Garrison Commander (GC) is now at the IOC coordinating with his staff. The GC requests an update from the Battle Captain who provides details about the train derailment and informs him that all members of the IOC are present except the Director of Public Works (DPW) who is stuck on the other side of the derailment site.*

**Questions:**

1. What information do you need at this point? What questions do you most want answered? Why?

**Discussion points:**

Consider gathering information regarding the train, evacuations, hazards, personnel on scene

Possible questions students should ask include:

- Did anyone contact the railroad?
- What chemicals are on board the train?
- Do we have a manifest? Does it list the hazardous materials?
- How can I obtain the manifest or other information about the hazardous materials?
- Are we equipped to handle a chemical spill? What resources do we need?

***The goal*** of this question is to increase awareness about the information requirements during emergency incidents. It is important to teach students what information to ask for, how to ask for that information, and who to ask for each piece of information.

***Themes address:*** Assess – collect and assess information and understand the situation

Figure 6. Facilitator Guide questions and discussion points.

The Facilitator Guide provides a brief description of each scenario segment followed by segment questions and discussion points. It contains information about how to leverage the Red

Cape training capabilities and expert themes to deliver knowledge and enhance student experience. It provides strategies for facilitating exercises, including questioning techniques, how to critique decision-making, and how to promote group and self-feedback. The Facilitator Guide has two appendices, one provides a full description of the themes and the other is a printable version of the segment questions and discussion points with room for facilitator notes.

### **Garrison Commander Training Conclusions**

The exemplar training created for the U.S. Army Management Staff College includes three scenarios presented using multimedia including photos, animation, and voice narration. These presentation modes accommodate various learning styles and immerse learners in the scenario. Observing the current theme-based training exercises and talking to instructors and students provided insight that allowed us to address needs specific to garrison commanders. An interactive and immersive scenario environment was developed that provided facilitators with targeted questions and discussion points created specifically to address the themes and enhance students' critical thinking.

The training illustrates the diversity of theme-based training. In addition to computer-based training, it is possible to incorporate the themes into facilitated discussions to insure students have a solid understanding of the themes and their associated cognitive skills. Previous Red Cape training within the Garrison Commander Course introduced the themes, and this update extends that training to address learning styles, incorporate multi-media, and provide an immersive learning environment.

### **General Discussion**

This research and development project extended the original theme-based training developed by ARI to include computer-based simulation training, a computerized scenario creation tool, and multi-media in-class training scenarios for garrison commanders. The research results illustrate the flexible nature of theme-based training. The computer-based training leveraged a pre-existing National Guard training product to present individuals and groups complex scenarios that incorporate the themes into situations. As students train to the themes, their actions indicate their theme-based behaviors, providing insight into the cognitive skills in which they are proficient and the skills in which they need further training. The focus of the Global Response training is on the behaviors displayed by students in response to situational factors. They increase their theme-based skills by taking action; thus, they learn from experience. By first using CTA to collect and analyze the critical decisions and tasks of emergency responders, scenarios were created that replicate real-world crises, including the tough challenges, unexpected consequences, and the strategies used by experienced responders.

The Global Response training provides instructors with ready-made scenarios. This is a good way to introduce responders to the tool and allows for instant access to training. However, as their familiarity with the tool increases and training needs change, the exercises would become obsolete. To counter this, instructors were provided with the capability to modify these scenarios or create their own scenarios. Thus, this tool will remain relevant as training needs evolve to accommodate the changing needs. The Vignette Creation Tool is a user-friendly tool

that allows trainers to create and customize exercise vignettes to fit current and evolving training needs. With this tool, trainers are able to link scenario injects and expected actions to behavioral themes. The scenario creation tool is an important enhancement to the simulation-based training program and contributes to command-level response training beyond this research—allowing the National Guard to develop exercises for a variety of requirements.

Applying theme-based training to classroom settings allows for facilitated group discussions that enhance critical thinking skills and provide a deeper understanding of the themes. Three exercises for garrison commander training were created to advance their current Red Cape exercises. Facilitators were provided with critical thinking questions and discussion points after each exercise segment. These questions stem directly from the CTA interview data and challenges students to think about a variety of situational factors, weigh multiple strategies, and contemplate various courses of action. A comprehensive facilitator guide explains the themes and identifies the major themes addressed in each exercise segment.

As a package, these three training products provide a comprehensive training program in multi-agency emergency response. They each engage students in deliberate practice by allowing for repeated performance and constant immediate feedback about performance on difficult aspects of emergency response. Trainers are able to structure scenarios to address students' needs and can inject questions to facilitate performance feedback during both the computer-based and in-class exercises.

Participant response was positive, though more evaluation is necessary to fully assess usability and ascertain if gaps in training still exist. The following bulleted list provides other limitations identified during the research.

- Scenario developers currently do not have access to news reports and other multi-media similar to those present in the scenarios. It would be useful to develop a repository of multi-media content where developers can store and find multi-media to fit their needs.
- The focus of the vignette creation tool was on scenario development. The scope of this effort did not allow for the creation of a tool that assists with scenario design. A design tool would walk users through the design process, including picking a scenario topic (i.e., earthquake), choosing roles, and thinking up creative injects and consequences that address specific themes. The instructional overview guide provides some guidance, but not to the extent as would an automated tool.
- The VoIP is a useful addition to this tool; however, it is currently not possible to record students' conversations. Without the ability to track what students say to each other, instructors and students cannot evaluate these conversations and provide feedback. If a method to gather this information becomes available in the future, it would be beneficial to add it to the tool. With this information, instructors and students can evaluate question phrasing, tone of voice, command style, and use of themes.

These limitations suggest future work stemming from this research. In addition to the potential extensions to these tools mentioned above, the following bulleted list provides other future work recommendations.

- Further enhancement of the AAR to include a more detailed analysis of actions, including e-mail and telephone call content, explicit explanation of the pros and cons to each action choice (both the actions taken and those not taken), and automated annotation in addition to instructor annotation.
- A web-based portal for trainers to share the vignettes they create, multi-media, ideas for training, questions about training issues, etc.
- Extend the in-class garrison commander training to a computer-based exercise program. Conducting in-class exercises followed by computer-based training insures that student skill level matches the training level. Similarly, creating comprehensive in-class exercises for military and other emergency responders will introduce the skills needed to perform in the computer-based exercises and beyond.
- Evaluation participants made suggestions that can be easily incorporated into the tool in the future. Participants would like the capability to use radios within the exercises. They would also like better definitions of each role within the scenario and greater clarity on the assets available throughout the scenario.

This training package advances the theme-based method, provides much needed training for emergency responders from multiple agencies whose job it is to resolve the nation's biggest crises. Thankfully, these events are not common, however, when such events do occur, our national and military responders must be prepared. The best preparation comes from experience. The exercises created with these training tools provide that experience-based training. This allows responders to develop the mental models necessary to become proficient prior to actual events. By providing consistent theme-based training of complex cognitive skills and behaviors, we reduce "on-the-job-training" for critical job requirements.





## References

- Anderson, D. M. (1961). *Elements of design*. New York: Holt, Rinehart, & Winston.
- Bloom, B. C. (Ed.). (1956). *Taxonomy of educational objectives: Handbook I, cognitive domain*. New York; Toronto: Longmans, Green: David McKay Company, Inc.
- Crandall, B., Klein, G., & Hoffman, R. R. (2006). *Working minds: A practitioner's guide to Cognitive Task Analysis*. Cambridge, MA: The MIT Press.
- Ericsson, K. A., & Charness, N. (1994). Expert performance: Its structure and acquisition. *American Psychologist*, 49(8), 725-747.
- Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100(3), 363-406.
- Harris-Thompson, D., Mills, J. A., Ross, K. G., Peluso, D. A., Baxter, H. C., & McCloskey, M. (2004). eMAGINE: electronic Medium for Authoring and Generating Instructional Exercises (Final Technical Report under Contract No. N61339-02-C-0157 for NAVAIR-ORLANDO TSD). Fairborn, OH: Klein Associates.
- Houser, R., & DeLoach, S. (1998). Learning from games: Seven principles of effective design. *Technical Communication*, 45, 319-329.
- Klein, G. (1998). *Sources of power: How people make decisions*. Cambridge, MA: MIT Press.
- Klinger, D. W., & Klein, G. (1999). Emergency response organizations: An accident waiting to happen. *Ergonomics In Design*, 7(3), 20-25.
- Long, W. G., & Klein, G. (2006). *BattleSense: An innovative design approach for combat systems* (Draft Technical Report submitted under Contract No. N00178-05-C-3042 to the Naval Surface Warfare Center in Dahlgren, VA.). Fairborn, OH: Klein Associates, A Division of Applied Research Associates.
- Lussier, J., & Shadrick, S. (2003). *Adaptive thinking training for tactical leaders*. Paper presented at RTO HFM Symposium on Advanced Technologies for Military Training (NATO RTO-MP-HFM-101), Genoa, Italy, October 13-15, 2003.
- Lussier, J. W., Shadrick, S. B., & Prevou, M. I. (2003). *Think like a commander prototype: Instructor's guide to adaptive thinking* (Research Product 2003-01). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Pigora, M. A., Tamash, T., & Baxter, H. C. (2006). *Training novices and experts: A common assessment and mechanism for knowledge, skills, and abilities*. Paper presented at the IIITSEC, Orlando, FL.

- Ross, K. G., & Pierce, L. G. (2000). Cognitive engineering of training for adaptive battlefield thinking. In *IEA 14th Triennial Congress and HFES 44th Annual Meeting* (Vol. 2, pp. 410-413). Santa Monica, CA.
- Schaefer, P. S., Shadrick, S. B., Beaubien, J., & Crabb, B. T. (2008). *Training effectiveness assessment of Red Cape: Crisis action planning and execution* (Research Report 1885). Arlington, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Shadrick, S. B., & Lussier, J. W. (2004). *Assessment of think like a commander training program* (Research Report 1824). Arlington, VA: U. S. Army Research Institute for the Behavioral and Social Sciences.
- U.S. Army Training and Doctrine Command. (2008). The U.S. Army concept for the human dimension in full spectrum operations 2015-2024. *TRADOC Pamphlet 525-3-7*.
- U.S. Department of Homeland Security. (2008). *National response framework* (Guide to how the Nation conducts all-hazards response.). Washington DC: Author.
- Weick, K. E. (1995). *Sensemaking in organizations*. Thousand Oaks, CA: Sage Publications.

## Appendix A

### Think Under Fire (TUF) Decisions

A web-based simulation system for exercising critical decision-making skills.

**Description.** The TUF Decisions is a simulation-based training system that allows individuals or teams to make decisions in realistic situations and see the outcomes. The TUF Decisions is completely web-based with no software install; the user needs only a broadband connection and java-enabled browser such as Internet Explorer to join an exercise. Each exercise scenario presents the unfolding situation through realistic injects including email, news videos, website articles, and simulated telephone calls. Users make decisions and mitigate the incident by responding to messages, communicating with teammates, and giving commands to simulated entities.

**Uses.** The TUF Decisions is data driven, and can exercise any domain. The TUF Decisions have been used to exercise National Guard Joint Operations Center staff, Public Health and Emergency Management personnel, and Transportation professionals, among others. Injects can be written with specific answers for knowledge acquisition and testing, or free form responses for exercise play.

**Running an exercise.** The TUF Decisions exercises are accessed through a web portal. The user logs in to run an individual exercise scenario, join a scheduled team exercise, take a tutorial, or access training records. For an individual exercise, the user selects a scenario, a role to play, and a state and county to exercise in. If the user selects a “novice” skill level, TUF Decisions will display task prompts that lead the user through the exercise.

**Learning approach.** Research reveals that experience plays a central role in making effective decisions, especially during critical situations. The TUF Decisions exercises build a pattern base that allows decision makers to make better recognitional decisions when real world challenges arise. The TUF Decisions offers progressive training, from acquisition of knowledge through informational presentations, to building of skills in an individual role trainer with simulated teammates, to formulating abilities by exercising with a team in a real-world environment.

Concrete feedback is required to build expertise. Each role is assessed on taking the steps to complete cognitive tasks such as maintaining control of the scene, communicating both within the team and with outside agencies, and utilizing resources. Responsibilities may overlap between team members; the assessment reveals how team members work together to achieve overall goals.



	Assign creation of Task Assignment Forms for received missions and distribute the completed TAF to assigned units. Note: Time ran out to do this task.	
	Update the BUB J3 and Force Protection slides Completed By: Andy	
	Get a state tracking number for every mission. Note: A reminder was sent. To Be Completed By: JFHQ.BC	

## Appendix B

### Global Response: Large Scale Interagency Training Interview Guide: Camp Atterbury

#### Interview Objectives

*Objective 1:* Understand the difficulties National Guard responders at the operational level face when making decisions in multi-agency emergency response environments

- Identify critical tasks.
- Identify challenges to interagency coordination and response.
- Identify the cues and factors that contribute to effective response during crisis events.

*Objective 2:* Clarify current training needs and gaps in training for military response to multi-agency crisis events

- Identify areas where decision skills can be enhanced.
- Identify training scenarios that would add benefit to crisis action training.
- Identify training challenges.

#### Probe Questions

*Ask for the most difficult challenge first. If time, ask for the next difficult challenge and so on. If they say there were no other difficulties, then ask for the first decision point involving crisis action response, the second decision point, etc.*

#### Part I

Briefly describe a multi-agency emergency response situation where you were particularly challenged to make difficult decisions.

*What was the most difficult challenge (challenging decision) you faced in this situation?*

- What made this challenge difficult?
- What was your main objective during this task?
- How did this challenge impact your ability to achieve this task?
- What was your biggest concern when approaching this task?
- How did working with other agencies influence your ability to act (positive/negative)?

*Which cues/factors did you consider as you attempted to complete this task?*

- How did you decide to approach this problem?
- What specific factors played into this decision?
- What did you see that led you to choose this course of action (COA)?
- What information did you use in making this decision?

*What is the first action you took when confronted with this challenge?*

- What did you expect to happen when you took this action?

- Why do you think things happened the way you did/did not intend?
- What other COAs did you consider? Why did you rule them out?
- Are there any alternative actions that might have worked?

*How might an inexperienced responder (or someone with no experience) handle this task?*

- What errors might an inexperienced person make in your position in this situation
- What factors/cues/indicators would someone with little experience miss as he/she tried to accomplish this task?
- What do you know now that you wish you knew when you started as an operations officer?

*Repeat questions for the next challenging task, and the next, etc., as time permits*

## Part II: Instructional Challenges

*What are the biggest challenges faced when preparing responders for real-life large-scale incidents?*

- Describe any decision-making challenges that are particularly tough for new responders.
- Describe any challenges faced by new responders when they work with multiple agencies during emergencies.
- What are the most difficult tasks to accomplish when training for large-scale response?
- Are there any training areas where you would like to see more/different training?
  - Describe the training components you think are the most useful.
  - Describe any training components/scenarios you would like to see added in the future.

*If you were going to create a training scenario that addresses some of the challenges described today, what would you put in that scenario?*

- What factors would add ambiguity or uncertainty to this situation?
- To reach a successful outcome, what are the critical tasks that need to be completed?
- What cues and factors should trainees focus on to understand and make decisions about this scenario?
- What vital pieces of information should they seek out as they deal with the situation?
- What are the possible courses of action they can take that will lead to a satisfactory outcome?

## Appendix C

### Red Cape Themes Overview

*Theme-based training* targets specific skills by identifying the cognitive skills of experienced decision makers and categorizing them into themes. *Themes* form the thinking skills required within a given set of circumstances. Theme-based training provides instructors with a method for training complex critical thinking skills. By training to themes, students increase ability to assess situations, synchronize personnel, assets, and agencies, and execute plans in a timely manner. The Red Cape themes presented below describe the processes and cognitive activities required to perform in multi-agency emergency response environments. Experienced National Guard, Federal, and local emergency responders provided information about their decision experiences in actual events, such as Hurricane Katrina, tornadoes, floods, airplane crashes, and wild fires. This information was synthesized to form the Red Cape themes presented below. The eight themes are categorized into three processes key to emergency response: Assess, synchronize, and execute.

**Processes:** A series of interdependent actions executed during multi-agency response to crisis events. These actions form an evolving response pattern aimed at resolving the crisis. Through these actions, it is possible to employ, maintain, and revise plans. These processes involve activities such as leveraging previously established relationships, and establishing morale and a battle rhythm that promotes effective inter- and multi-agency response. There are three processes: Assess, Synchronize, and Execute. Themes are associated with each process.

**Themes:** The expert cognitive activities that responders engage in to achieve successful resolution of the crisis. These themes illustrate the processes and provide behavioral patterns through which responders can model their understanding, plans, and decisions.

#### Definition of Processes

1. *Assess:* To analyze and process relevant information in a crisis event in order to develop situational understanding and take action appropriate to the current and unfolding situation.

##### *Themes*

1. Collect and assess information and understand the situation.
2. See the big picture and predict events.

2. *Synchronize:* To bring together necessary assets, personnel, information, and action steps in order to create a team and environment that promotes effective planning, communication, and response to the situation.

##### *Themes*

1. Coordinate internally and externally across all agencies.
2. Acquire, prioritize and allocate assets.
3. Establish chain-of-command.

3. *Execute*: To take action at appropriate times and in appropriate manners in order to affect change that drives the situation to a satisfactory conclusion.

*Themes*

1. Recognize decision points.
2. Address public and responder needs.
3. Maintain mission priorities.

Themes Associated with Each Process

Assess

*1. Collect and assess information and understand the situation.*

*Definition*: Effective commanders and staff are able to quickly determine how and where to collect the information necessary to develop a situational understanding. They are able to quickly evaluate and prioritize incoming information and construct a coherent picture of unfolding events. They draw on their experiences, along with the experiences of those around them, to understand the situation. They focus on important cues to interpret the current situation and formulate plans that leverage these situational elements in order to resolve the crisis.

*Explanation*: Decision makers must make sense of what is going on in a situation before they can make decisions and take action. They do this by scanning the environment for clues that will help them understand what is occurring. They look for patterns that they recognize and then construct a story that fits their existing knowledge. Patterns consist of all the things present in the situation including sights, sounds, smells, human behaviors, environmental conditions, and incoming reports. The amount of information present in critical events is more than any individual person can perceive and process. They must choose which pieces of information they attend to and what to filter out. The ability to gather and sort information develops with practice and experience.

*Behavioral indicators*: Someone with a good understanding of the situation who is adequately filtering information will display indicators such as:

- Issue orders or offer guidance to deal with future events, not just immediate concerns.
- No longer seek information in order to define the situation.
- Actively try to understand the progress and consequences of earlier decisions.
- Ask direct, specific questions rather than general questions (i.e., “What is going on?”).
- Focus on specific incoming information and filter out less important information.

*Instructor example*: To train students to *collect and assess information and understand the situation*, the instructor can insert a report into the scenario about an incident, such as a suspicious vehicle sighting. The student would then need to request information from others, assess that information, and take action appropriate to the information they received. The instructor can track these activities during the exercise and in the after action report.



## *2. See the big picture and predict events.*

*Definition:* Effective commanders and staff construct a coherent picture of unfolding events and see the overarching implications of possible actions. They take a global view of the situation and predict the consequences associated with various responses or non-responses.

*Explanation:* When a decision maker only focuses on the immediate problem without looking at the problem in the context of the entire situation, their decisions will likely have unintended consequences. Experts tend to see more than just bits and pieces of the problem by seeing the entire picture in one complete snapshot and creating a story around it. The story tells them what has gone on to create the current situation and what they must do to achieve a successful outcome. This story also allows them to evaluate action choices and predict the positive and negative outcomes. Those who do not make this “holistic” evaluation are likely to see only pieces of the picture and fail to anticipate what will happen next.

*Behavioral indicators:* You can expect someone who is seeing the big picture to:

- Focus on larger concerns, rather than deliberating over only small matters.
- Take into consideration the consequences of their actions to outside agencies and the community.
- Make interpretations beyond observable facts.
- Create a story from small bits of information.
- Not focus on only one aspect of the situation (i.e., finances, communication equipment, traffic management).
- Take effective action when new information comes in.
- Set a clear battle rhythm and keep motivation up.

*Instructor example:* To train students to *see the big picture and predict events*, the instructor can create an e-mail that informs students that toxic chemicals are leaking into the Post’s water supply. The main response may be to shut off the water supply, but the big picture might show that turning off the water supply will do more damage in terms of health risks, costs, and infrastructure dysfunction (i.e., patient care at the hospital). If the student chooses to turn the water off without mitigating these risks, the instructor should create injects, such as e-mails, with reports of these consequences.

## *Synchronize*

### *1. Coordinate and communicate internally and externally across all agencies.*

*Definition:* Effective commanders and staff collaborate within and across agencies in a manner that develops a shared understanding of the mission and of responder roles, while enabling the synchronization of mission goals and objectives. They use relationships and diplomacy to identify and minimize collaborative barriers and to produce maximum synergy. They communicate in a timely matter, use a common language across agencies, and find workable solutions to communication barriers such as lack of interoperability.

*Explanation:* It is necessary to coordinate and communicate with all responding agencies. Collaboration means more than just working side-by-side with each other, it means understanding what others need to operate effectively. This promotes a shared understanding of the task and responder roles. It is important to leverage established relationships among community leaders in order to establish community support and cooperation. It is important *what* decision makers say and *how* they say it. Effective decision makers use diplomacy to convey an understanding of the public need even while they are requesting assistance and taking control of turbulent situations. *When* decision makers convey information also affects operations. If decision makers withhold information for too long, erroneous and detrimental actions may result. If they give out information too soon, it may not be factual, or it may be useless without additional information.

*Behavioral indicators:* You can expect someone who is coordinating and communicating across agencies to:

- Speak plain English, avoiding acronyms and agency-specific language.
- Communicate with outside agencies and political leaders in the community.
- Establish a shared communication system.
- Adapt to communication equipment failures (i.e., sending a runner, word-of-mouth spread of information).
- Adapt communication style to fit audience (i.e., political leaders vs. staff).
- Hold regular briefings and huddles to utilize the experiences of others in the room.
- Calls upon the relationships fostered prior to the event.
- Make clear the chain of command, who people should report to, where people should report.

*Instructor example:* To teach students to *coordinate internally and externally across all agencies*, the instructor might create an inject where a staff member knocks at the student's door and states that the incident commander (Fire Chief) is not allowing emergency responders from the local community on base to help fight fires, care for the wounded, and keep the Post secure. The Fire Chief did this even though the Major General requested outside responders' assistance. The student should make calls and send e-mails to find out why this is occurring and work to clear up any misunderstandings, coordinate requests, and resolve the issue in a manner that creates cooperation between agencies.

## *2. Acquire, prioritize, and allocate assets.*

*Definition:* Effective commanders and staff determine the type and amount of equipment and personnel that is necessary to accomplish the mission. They are effective in acquiring, prioritizing and deploying the necessary assets. They think creatively to use assets that are readily available and take advantage of the expertise around them in order to mitigate the situation.

*Explanation:* Thinking creatively during a crisis allows decision makers the flexibility to find solutions when assets are not available as planned. Thinking creatively involves acquiring assets from atypical sources and using available assets for unconventional purposes. They are aware of what assets are available and can predict when resources will run out. They are able to allocate

assets to the appropriate locations at the appropriate times and in the appropriate quantities. Assets include human assets, and effective decision makers utilize the unique skills of those around them. This is especially important when responders have careers outside of their responder role.

*Behavioral indicators:* You can expect someone who is effectively managing assets to:

- Maintain a realistic assessment of asset availability.
- Be aware of limits to resources.
- Explore options for obtaining assets.
- Prioritize asset distribution to meet critical and long-term needs.
- Not just “throw assets at the problem.”
- Knows when to call in support from external agencies.
- Get advice from others and use their experiences as a guide.
- Appropriately ration resources, including human resources.

*Instructor example:* To teach students to *acquire, prioritize, and allocate assets*, the instructor can create a scenario that puts a severe strain on resources, such as multiple explosions at different locations around Post. Students should request regular updates on the status of available resources and actively look to acquire resources from other agencies.

### *3. Establish chain-of-command.*

*Definition:* Effective commanders and staff make clear to all personnel who is in charge of an incident. They remain flexible, build strong teams, and create an environment that allows subordinates leeway to share information and ideas, make decisions, and complete tasks. They clearly and concisely express intent and mission requirements, giving orders and direction that are specific enough to be clear, but flexible enough for personnel to achieve under dynamic situational constraints. They are sensitive to political and community relationships and to the requirements of higher commanders.

*Explanation:* A clear understanding of who is in charge establishes needed structure and clarity during a crisis. Decision makers need to make clear what are each responder’s responsibilities. It is important that decision makers remain flexible as responders handle their responsibilities in their own manner and that responders know they have leeway to think creatively and proactively in changing situations. All agencies should have a shared understanding of the mission requirements. Decision makers need to express empathy and patience toward their staff members and members of other agencies, particularly when the emergency is local. Unlike in overseas operations, local events have direct impact on responders’ families, friends, and property. Even though a decision maker may be in charge of the scene, they still need to work within the sensitivities of local political structures and be aware of delicate community relationships.

*Behavioral indicators:* You can expect someone who is effectively establishing a chain of command to:

- Clearly communicate the command structure.

- Know when to relinquish command to the agency more suited to deal with the current situation.
- Empower staff to make decisions and not dictate how to complete each task or micro-manage. Insure that only one person is in charge.
- Clearly express intent and mission objectives.
- Provide only the necessary information to higher commanders and community leaders

*Instructor example:* To teach students to *establish chain-of-command*, instructors can create an inject where a staff member knocks on the student's door and asks which person in the EOC can offer guidance and approve a plan. The student should be able to guide the staff member to the correct person or address the staff member's issue if it is appropriate for the role.

Execute

### *1. Recognize Decision Points.*

*Definition:* Effective commanders and staff recognize when in a crisis they need to make a decision. They develop effective courses of action and predict the effects of their decisions. They continually evaluate situations and recognize when situational changes require changes in action. They determine when it is appropriate to act versus wait. They plan for future events and take proactive steps to shape events in their favor.

*Explanation:* The decision to act versus to wait requires a quick cost/benefit analysis, often when there are a great number of unknowns facing the decision maker. Those with a lot of experience are able to predict the outcomes of action (or inaction). They know when it is time to act and when it is okay to wait and gather more information. They are confident; thus will take action in situations where less experienced decision makers would wait. They can foresee how the situation will change based on the actions they take. Because they can predict the consequences of their actions, they are able to take steps during an incident to shape events in their favor.

*Behavioral indicators:* You can expect someone who effectively recognizes decision points to:

- Take decisive action before it is too late.
- Not make hasty decisions in reaction to small changes in the situation.
- Recognize when a situation is not an immediate threat.
- Reacts to critical situations immediately, without taking time to consider all consequences.
- Ask for outside assistance when they cannot handle a situation without outside assistance.
- Willing to change action in response to unfolding events.
- Notices changes in conditions and when to shift priorities.
- Take effective action when plans do not go as expected.
- Be able to conduct current operations while planning future operations.
- Be able to slow down and observe the situation instead of rushing in.
- Be able to adjust procedures to fit the current situation.

*Instructor example:* To teach students to *recognize decision points*, the instructor can create an ambiguous situation that requires information from different sources, such as conflicting reports of explosions (i.e., somebody says it's a bomb threat, someone else says it's a bomb explosion, a third person says it's the explosion of a gas main). The student should gather enough information to understand the correct situation and take action. For instance, the student receives more reports of a bomb explosion, receives Intel of a terrorist threat, and gets a call from the incident commander who says it is a bomb explosion. The student should take actions to secure Post, evacuate people, and organize a response.

## *2. Address Public and Responder Needs.*

*Definition:* Effective commanders and staff notify the public and media about the situation. They use a variety of media platforms to inform the public about upcoming responder actions. They are sensitive to community needs and act to alleviate any public fear and/or resentment. They attend to the personal and professional needs of the responders.

*Explanation:* It is necessary to work with the media to disseminate accurate information and calm public fear. Good information management prevents erroneous reports and negative rumors about responder actions and intent. If responders do not communicate with the media, the media will release stories based on the unauthorized reports of witnesses and bystanders. Decision makers need to release a message that is accurate and sensitive to the needs and concerns of the community. They also need to be responsive to public need, rather than appear insensitive. It is vital that decision makers attend to the needs of responders, who need to maintain energy and good health. Responders to local disasters are concerned about their families and need leeway to care for loved ones. To keep morale up, decision makers need to show empathy for responders' concerns for their families. Decision makers should make accommodations for responders who have obligations to other employers.

*Behavioral indicators:* You can expect someone who effectively recognizes decision points to:

- Take proactive steps to prevent casualties.
- Determine if contractors should handle situation before acting (i.e., with bulldozer).
- Communicate with the public about actions the military is going to take.
- Allow responders/troops to deal with family and employment issues.
- Show concern for public frustration and fear.
- Use the media to get information out to the community.
- Insure that responders get food and sleep.

*Instructor example:* To teach students to *address public and responder needs*, the instructor can create a telephone call from the media asking to confirm reports of an incident on Post that is unknown to the student, such as an airplane crash. The student should confirm the report and take steps to control the news story in a way that insure only correct information is reported, and only when the time is right.

### 3. *Maintain Mission Priorities*

*Definition:* Effective commanders and staff recognize that their primary mission is to protect human life and property while insuring the safety of incident responders. They resist responding to missions or requests that do not advance mission goals or that neglect mission priorities. They do not lose sight of the mission priorities when dealing with external pressures or personal disputes.

*Explanation:* It is important to keep focused on the mission goals and not be distracted by secondary tasks or issues that are not critical to the big picture. External pressures, such as commanders' personal agendas and the priorities of political leaders, can distract decision makers from mission priorities. In instances where the community is suffering and people are asking for help, decision makers must determine what they can and cannot support both in terms of available resources and in terms of mission priorities and scope. The decision maker must look beyond the immediate needs of those in front of them to the long-term needs of the larger population.

*Behavioral indicators:* You can expect someone who effectively maintains mission priorities to:

- Not try to feed everyone or address needs outside mission scope.
- Take steps to insure safety rather than react on emotion.
- Takes actions that reflect mission priorities.
- Act appropriately when in a supporting role.
- Use diplomacy when resisting external political pressures.
- Mitigate consequences of non-mission specific actions both in the short- and long-term.

*Instructor example:* To teach students to *maintain mission priorities*, the instructor can create a report from a staff member stating that responders are reporting exhaustion after 36 hours into a rescue operation. The same responders have worked the entire 36 hours with no relief or backup available. Students should remedy the situation by finding replacement staff, and by providing food, cots, showers, and other necessities. This situation can be prevented and instructors should provide students the opportunity to take preventative actions such as insuring a relief schedule is set up and manpower is available. If they do not take these actions, they should see the consequences (exhaustion, loss of manpower with no replacements).

## Appendix D

### Evaluation Survey Day 1: Camp Atterbury

#### POST RUN EVALUATION FORM PARTICIPANT REACTION – TUF-D SIMULATION

**Company: Instructor(s):**

**Conducted by:**

**Course:** TUF-D Simulation Training & Evaluation

**Date:**

**Unit/Rank:** \_\_\_\_\_

**Position:** \_\_\_\_\_

**Years in this position:** \_\_\_\_\_

**Role during actual emergency event:** \_\_\_\_\_

**Role Played in Simulation:** \_\_\_\_\_

Five learning objectives are listed below. Please rate the degree that your ability to accomplish these objectives improved due to participation in this simulation. Use the following scale:

- 1 – None = no apparent improvement in my ability to perform this objective
- 2 – Slight = slight improvement in my ability to perform this objective
- 3 – Moderate = moderate improvement in my ability to perform this objective
- 4 – Substantial = substantial improvement in my ability to perform this objective
- 5 – Exceptional = exceptional improvement in my ability to perform this objective

After completing the simulation, the participant will be able to...	<i>Improvement</i>				
	None	Slight	Moderate	Substantial	Exceptional
1. Manage information and communications during and after an earthquake disaster	1	2	3	4	5
2. Maintain focus on mission priorities	1	2	3	4	5
3. Assess the situation and select the best course(s) of action	1	2	3	4	5
4. Reflect upon the simulated experience and discuss the reasons for their decisions	1	2	3	4	5
5. Identify and use assets as needed	1	2	3	4	5

Please rate the following comments about the Simulation using the following scale:  
 1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

The Simulator	Agreement				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The simulation presented realistic content	1	2	3	4	5
2. I have worked harder during this exercise than in most exercises I have participated in	1	2	3	4	5
3. From using this simulation tool, I have a better understanding of how to make decisions during a crisis	1	2	3	4	5
4. Overall, I rate this simulation tool as excellent	1	2	3	4	5
5. I would participate in training using the simulation in the future	1	2	3	4	5

### Short Answer

**Directions:** Please answer the following questions about using the simulator.

1. Did the simulation tool meet your expectations? Y N

Why or why not

2. To what degree did the simulation environment present a realistic environment in which you could perform your assigned role

Not at all realistic	1	2	3	4	5	Very realistic
----------------------	---	---	---	---	---	----------------

Please provide an explanation of your rating:

3. How closely did your role in the simulation match your role in the real world?

No match at all	1	2	3	4	5	Exact match
-----------------	---	---	---	---	---	-------------

Why or why not



4. Should this simulation tool be incorporated into training/education courses?

<i>Do not recommend</i>	1	2	3	4	5	<i>Highly recommend</i>
-------------------------	---	---	---	---	---	-------------------------

Why or why not?

5. Please comment on skills, concepts, and techniques you learned by using the simulation tool:

6. What did you like best about using the simulator?

7. What did you like least about using the simulator?

ADDITIONAL COMMENTS:

## Appendix E

### Evaluation Survey Day 2: Camp Atterbury

#### POST RUN EVALUATION FORM PARTICIPANT REACTION – SCENARIO DEVELOPER

**Company: Instructor(s):**  
**Conducted by:**

**Course:** TUF-D Vignette Creation Tool Training & Evaluation      **Date:**

**Unit/Rank:** \_\_\_\_\_

**Position:**

**Years in this position:**

**Role during actual emergency event:**

**Role Played in Simulation:**

Five learning objectives are listed below. Please rate the degree that your ability to accomplish these objectives improved due to participation in this simulation. Use the following scale:

- 1 – None = no apparent improvement in my ability to perform this objective
- 2 – Slight = slight improvement in my ability to perform this objective
- 3 – Moderate = moderate improvement in my ability to perform this objective
- 4 – Substantial = substantial improvement in my ability to perform this objective
- 5 – Exceptional = exceptional improvement in my ability to perform this objective

After completing the scenario developer training, the participant will be able to...	<i><b>Improvement</b></i>				
	None	Slight	Moderate	Substantial	Exceptional
6. Explain the scenario development process	1	2	3	4	5
7. Identify different types of simulated injects	1	2	3	4	5
8. Add, delete, and modify timeline segments	1	2	3	4	5
9. Add, delete, and modify simulation injects	1	2	3	4	5
10. Construct an assessment	1	2	3	4	5

Please rate the following comments about the Scenario Developer using the following scale:

1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

The Scenario Developer	Agreement				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6. The scenario developer was easy to use	1	2	3	4	5
7. This tool will allow me to create realistic scenarios and provide useful and relevant training	1	2	3	4	5
8. From using the scenario developer tool, I have a better understanding of how the simulation works	1	2	3	4	5
9. Overall, I rate the scenario developer tool as excellent	1	2	3	4	5
10. I would use the scenario developer tool in the future	1	2	3	4	5

### Short Answer

**Directions:** Please answer the following questions about using the simulator.

8. Did the scenario developer tool meet your expectations? Y N

Why or why not.

9. Would you recommend the scenario developer tool to others? Y N

Why or why not?

10. Please comment on skills, concepts, and techniques you learned by using the scenario developer tool:

11. What did you like best about using the scenario developer tool?

12. What did you like least about using the scenario developer tool?